

Land Management

The Preferred Alternative for Land Management on the NHAL State Forest

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Overview of Land Management Proposals

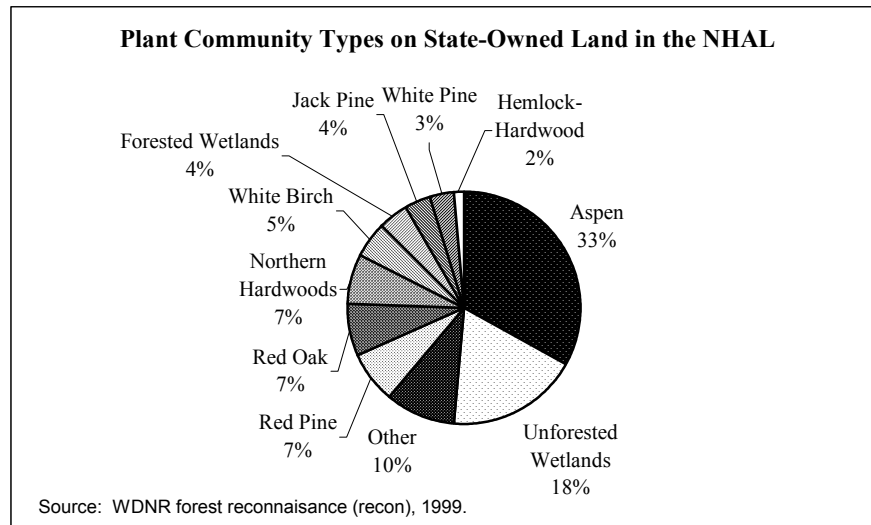
- **Red and white pine** dominated stands would increase slowly over the next 50-100 years from 11% to about 16% of the NHAL (from 25,000 acres to about 35,000 acres), meeting the opportunity for restoration of a mixed pine forest community. As red and white pine stands increase, they would continue to contain a significant component of aspen, white birch, red oak, and other species.
- **Aspen** dominated stands would decline slowly but remain by far the most common dominant species, going from 33% to about 28% of the NHAL over the next 50-100 years (from 75,000 acres to about 65,000 acres). In addition, the percentage of red and white pine, red oak, and other species in some aspen stands would increase.
- Management for **old growth** in upland areas would occur on 17% of the NHAL. Some old growth stands would be actively managed, and some would be passively managed. Older individual trees, particularly white pine, red pine, red oak, northern hardwoods, and hemlock would continue to be promoted in most stands.
- Over the last ten years, an average of 2,300 acres (about 1-1.5% of the NHAL) have been harvested each year. The **annual harvest** is dependent on many variables and fluctuates from year to year. Under the Preferred Alternative, *current levels of harvest would continue*, although the type and purpose of harvests would shift to reflect management objectives. About 40% of harvests would continue to be clearcuts, and about 60% would continue to be selective cuts.
- **Big Tree Silviculture** would continue to be used in the management of the NHAL. Big Tree Silviculture develops older white pine, red pine, northern hardwood, hemlock-hardwood, and red oak on high quality sites.
- The **900 lakes** on the NHAL would continue to be protected.
- All **wetlands** on the NHAL (22% of state owned land) would continue to be protected. Wetlands provide habitat for plants and wildlife, including many rare species. They also help maintain excellent water quality for lakes, rivers, and streams. Unforested wetlands would have no active management.
- **Habitat for forest game species** would continue to be incorporated into management of the NHAL. Habitat for ruffed grouse would be slightly reduced but still abundant on the NHAL. Populations of other game species such as white-tailed deer are unlikely to be changed by management of the NHAL.
- **Rare and endangered species** would continue to be protected and experience current or improved habitat. About $\frac{3}{4}$ of rare plants and $\frac{1}{2}$ of rare animals in the NHAL are found in wetlands. Rare species dependent upon pine communities would benefit. Birds such as eagles, osprey, and loons would continue to benefit from the NHAL's clean lakes and undeveloped shorelines. Forest management practices would continue to incorporate information on rare and endangered species.
- The **composition and structure of forests** would continue to become increasingly diverse as the variety of tree species found in each stand increases, much of the forest gets older, and snags, den trees, coarse woody debris, and supercanopy trees are maintained and enhanced through forest management.

Summary of the Land Management Section

Ecological Setting

Located in the heart of northern Wisconsin, the NHAL State Forest contains a large forested landscape dotted with lakes and wetlands. The forests of the NHAL are part of a complex ecosystem, with a mix of forest communities that provide habitat for a diversity of plants and animals. Most of the uplands have dry, sandy soils that can support red and white pine, aspen, white birch, red oak, and jack pine forest communities. A few upland areas have richer loamy soils that support northern hardwood (sugar maple and yellow birch) or hemlock-hardwood forest communities. Most of the forest is young to middle-aged, while a few areas contain old trees and old growth characteristics. The many wetlands and lakes on the NHAL help protect water quality and provide habitat for a variety of fish, birds, insects, and plants, including many rare species. About 71% of the NHAL is uplands, 22% is wetlands, 6% is unclassified, and 1% is developed.

The chart below shows the plant communities on the NHAL. Keep in mind that while the forest is grouped by dominant tree species, most areas contain a mix of trees. For example, an “aspen” area probably contains a mix of red and white pine, red oak, and white birch.



What is our ecological niche?

An important part of deciding how to manage the NHAL as a state forest is understanding what makes its forests and wetlands unique. The 225,000 acre NHAL State Forest is Wisconsin’s largest state property. It stands out for having one of the highest densities of lakes in the world, and abundant unforested and forested wetlands. The NHAL also stands out for its dry sandy soils, which have a high potential for red, white, and jack pine, aspen, white birch, and red oak. In the region around the NHAL, including most of the Chequamegon-Nicolet National Forest, the landscape is suitable for northern hardwoods or aspen, but not pines, white birch, or red oak. The landscape of the NHAL State Forest has been shaped by its ecological and human history. Before European settlement, most of the NHAL landscape was covered in a red and white pine forest, with a mix of white birch and aspen. The forest was shaped by fires that encouraged the growth of these species. Some portions of the NHAL with wetter soils and less fire had hemlock-hardwood communities. After the cutover of the late 1800s and early 1900s, hardly an old tree was left standing in Vilas and Oneida counties. Later, the NHAL State Forest was established to protect forest resources and the watersheds of several rivers. Since then, the composition of the forest has changed considerably. The NHAL stands out as one of

the best places in Wisconsin to restore a large-scale red and white pine forest with a mix of aspen, white birch, red oak, and jack pine.

How do the land management proposals fit into the planning process?

A range of alternatives on land management were presented to the public last year. From the many comments we received, it is clear that the public shares many values related to the forests, wetlands and lakes of the NHAL. People see the forest as an important public resource valued for its Northwoods character, its abundant woods, water, and wildlife, its wild and scenic value, and its contribution to local economies. For the specifics of land management, people expressed many strong and different opinions on aspen, old growth, biodiversity, game habitat, forest production, aesthetics, clearcuts, forested wetlands, and wild resources areas.

The Preferred Alternative provides a general overview of land management proposals on the NHAL. It combines aspects of several of the Land Management Alternatives presented last year. The Preferred Alternative forges a direction for management of the NHAL that would provide a variety of benefits through sustainable forestry. It incorporates state forest law, NHAL vision and goals, property staff experience, scientific expertise, and public input. Extensive research on land management issues contributed to the Preferred Alternative. This includes the Regional Ecology, Community Restoration and Old Growth (CROG), Sustainable Forestry, Monitoring and Evaluation, and Biodiversity Assessments, the Biotic Inventory and Analysis of the NHAL, and the Regional Analysis.

The next step is the development of the Environmental Impact Statement (EIS) and Draft Master Plan. These documents will provide a more detailed analysis of land management on the NHAL.

What are the land management objectives for the NHAL?

One Property Goal (page 4) is to provide a diversity of terrestrial and aquatic biological communities, including a range of forest types and age classes, with emphasis on communities that are special to the NHAL State Forest. Two other Property Goals include maintaining and enhancing aesthetic qualities of the NHAL, and providing a variety of renewable forest products consistent with forest capabilities. These goals would be accomplished through sustainable forestry, in which the dynamic forest ecosystems of the NHAL would be managed to provide ecological, economic, social, and cultural benefits for present and future generations.

The Preferred Alternative proposes several specific objectives for land management based on the history, niche, and Property Goals of the NHAL, along with extensive input from scientists, managers, and the public. One major objective is to slowly increase the dominance and abundance of red and white pine forest communities on the NHAL. Over the next 50-100 years, red and white pine dominated stands are expected to increase from 11% of the NHAL to about 16%. Aspen, white birch, and other species would continue to be a significant part of red and white pine stands. Red and white pine forests provide forest products, aesthetic qualities, and increasing regional biodiversity. Aspen dominated stands are expected to decline slowly from 33% of the NHAL to about 28% but aspen would remain by far the most common community type in the forest. Red and white pine, red oak, and other trees would increase in aspen stands. Aspen forests are valued for forest products and forest game species, among other benefits. Other forest communities on the NHAL such as northern hardwoods, jack pine, and white birch would be managed to maintain their current abundance. Because forests change slowly, few changes in overall forest composition would be apparent in the short term.

Another objective is to manage for old growth forests, because older forests are a missing or much reduced, ecologically significant component of the NHAL landscape. Under the Preferred Alternative, 17% of the NHAL would be upland forests managed for old growth characteristics.

These areas were identified through an extensive scientific process as the best places on the NHAL for old growth. They are mainly made up of red and white pine, red oak, northern hardwoods, and hemlock-hardwoods. Some of these areas would be passively managed, and some would be actively managed. In addition, some forested wetlands on the NHAL have old growth characteristics and would be managed for old growth.

The proposed land management also provides for many other objectives. Wetlands and water quality would be protected. The ecosystems of the NHAL would provide habitat for a diversity of plants, animals, and fungi. Rare, threatened, and endangered species would be protected. Habitat for forest game species would continue to be abundant on the NHAL.

What forest management would I see on the NHAL?

Under the Preferred Alternative, 1-1.5% of the NHAL would be harvested each year. This continues the current average level of harvests. About 40% of harvests would continue to be clearcuts, and about 60% would continue to be selective cuts.

An annual integrated planning process on forest management involves collaboration between scientists and managers in forestry, endangered resources, recreation, water quality, and wildlife. Decisions on forest management would be made annually through this process, based on the unique qualities of each site. Timber harvesting would incorporate aesthetic considerations and water quality protection.

Many different types of timber harvests and other vegetative management would be used on the NHAL, depending on individual site characteristics. The type of harvest used on any site is primarily determined by the requirements of the trees that are desired in the stand after the harvest. Aspen, white birch, jack pine, red pine and red oak need sunlight and open space to regenerate. Northern hardwoods and to some extent white pine can grow in more shade. Typically, aspen and white birch would be clearcut while retaining individual old red and white pine and red oak trees in the harvest areas. Over time, this would favor red and white pine and red oak. Pine stands would be thinned periodically and then clearcut to regenerate pine. Red oak stands are typically harvested in stages, leaving some older trees to drop acorns which sprout into young oak trees. Northern hardwoods would be selectively harvested. Jack pine stands would be clearcut. Ground disturbance such as scarification may be used to regenerate jack pine and white birch. Prescribed burning may be used to manage some forest and barrens communities. Some species such as red pine and jack pine would be planted. Hemlock stands would not be harvested; any management in hemlock stands would be to regenerate young hemlock trees. Passive management (no timber harvests or prescribed burning) would also be used in places on the NHAL.

How would different areas on the NHAL help meet different objectives?

The NHAL has been split into 11 Land Management Areas with individual characteristics and objectives. (See Map 6: Preferred Alternative Land Management Areas.) Areas 1, 2, 3, and 4 represent the typical sandy to sandy loam soils of the NHAL. These large areas contain a mix of forest types and would be managed for a range of objectives, including increasing older red and white pine, regenerating aspen and white birch, enhancing existing old growth, and protecting wetlands. Area 5 is the Manitowish Peatlands Wild Resources Area. In this area (the former Manitowish Wilderness Area) natural ecological processes would dominate and timber harvests would not occur. Areas 6 and 7 represent the two large peatlands on the NHAL. These wetlands would be passively managed to maintain the high quality wetland system. The uplands in these areas would be managed for a variety of objectives, ranging from old growth red and white pine to short rotation jack pine, depending on the site characteristics. Areas 8 and 9 are the Ruffed Grouse Habitat Management Demonstration Areas. They would continue to be managed with smaller, more frequent clearcuts to provide early successional habitat for

ruffed grouse and other forest game. Area 10 has a slightly richer and loamier soil, and includes some of the most intact old growth on the forest. It would be managed to maintain and enhance existing old growth sites within a broader northern hardwoods, white birch, and aspen forest. Area 11, the Winegar Moraines, has much different ecological characteristics from the rest of the NHAL. Its predominantly loamy soils would be managed for northern hardwoods and hemlock-hardwoods, while maintaining and enhancing existing old growth areas. The former Wild Areas would be managed according to the ecological objectives of the Land Management Areas they fall into. (See page 27 for management of the former Wild Areas.)

About 22% of the NHAL would be designated “Focus Sites.” (See Map 7: Focus Sites.) Management in these areas would focus on old growth characteristics or other ecological features in the uplands and protection of wetland and water resources in the lowlands. The Focus Sites were identified through an extensive scientific process and are based on the Biotic Inventory and the Community Restoration and Old Growth Assessment (CROG). The Focus Sites are listed individually under the Land Management Areas they fall into. Some Focus Sites would be actively managed, while others would be passively managed. The upland Focus Sites combined with the upland “Small, Scattered Old Growth” sites make up the 17% of the NHAL that would be upland forest managed for old growth characteristics (a very small amount of upland Focus Sites would be managed for pine barrens restoration). In addition, some forested wetlands are quite old and would also be passively managed for old growth characteristics. Unforested wetlands would be passively managed in the Focus Sites and the rest of the NHAL.

Focus Sites	Acres	% of NHAL
Forested Uplands	32,870	15%
Unforested Wetlands	12,800	5%
Forested Wetlands	4,030	2%
TOTAL	49,700	22%

Small, Scattered Old Growth	Acres	% of NHAL
Forested Uplands	4,700	2%

So what does all this mean?

As the largest state property in Wisconsin, the Northern Highland-American Legion State Forest is a wonderful public resource. The NHAL would continue to be managed to benefit present and future generations of Wisconsin residents, so that 50-100 years in the future, our children and grandchildren can continue to enjoy and benefit from the forests, wetlands, and lakes of the NHAL. Overall the future forest would be an older forest with more red and white pine and less, but still abundant, aspen. This future would continue to provide clean lakes and streams, a diverse and scenic forest, forest products, and habitat for many animals, including game and rare species.

The bulk of the Land Management section provides background and more detailed management information. Responses to common land management questions are given. Property-wide management is described for different forest community types, and specific information is given on ecosystem management, wildlife, endangered and threatened species, state natural areas, disturbance regimes, and lakes and streams. Then each of the Land Management Areas 1-11 is described, with a summary, description of setting, pie chart of current forest types, objectives, and list of Focus Sites.

Responses to Common Land Management Questions

Why should a mixed red and white pine forest be restored in some places on the NHAL?

The restoration of a red and white pine forest with a mix of aspen, white birch, red oak, and jack pine is one of the main opportunities identified for land management on the NHAL in the Regional Ecology Assessment. The NHAL falls mostly within the Pitted Outwash, a landscape with dry, sandy soils that featured an extensive red and white pine forest with associated white birch and aspen before the cutover of the early 1900s. Most of the surrounding area, including the Chequamegon-Nicolet National Forest, has richer loamy soils with the potential for hardwood or hemlock-hardwood forests. The Pitted Outwash is unique in north-central Wisconsin for its potential to restore a red and white pine forest. Because the NHAL is the largest public property in the Pitted Outwash, its forests offer the best opportunity in the region to increase the dominance of red and white pine.

How would aspen stands be managed on the NHAL?

Currently 33% of state-owned land on the NHAL is dominated by aspen. Following the cutover of these lands prior to state ownership, aspen increased dramatically across the landscape. The result was a forest of similar aged aspen. Under state management in the 1970s and 1980s, the goal was to diversify the age of aspen stands and increase species such as red and white pine and red oak. Aspen provides a variety of benefits, including habitat for white-tailed deer, ruffed grouse, and other game species, forest products, and ecological values. Most of the aspen communities on the NHAL have a large component of red oak, white birch, and white pine as associated species. Under the Preferred Alternative, most of the aspen communities on the NHAL would remain as a mixed forest dominated by aspen with associated species for the next 50-100 years.

According to the NHAL Regional Analysis, aspen is a common tree species across north-central Wisconsin and is declining slowly. Aspen would decline somewhat on the NHAL in the next 50 to 100 years, but would remain by far the most common tree. The expected shift would see aspen dominated stands decline from 33% to about 28% of the NHAL. Through the practice of Big Tree Silviculture, aspen stands are harvested but individual red oak, red pine, and white pine trees are retained on high quality sites. The shift in aspen dominance would occur gradually, as stands mature from perhaps 60-70% aspen (with 30-40% in red oak, white birch, and red and white pine) to a stand with 40-50% aspen (and 50-60% red oak, white birch, and red and white pine). Today, most of the aspen stands on the NHAL are between 10 and 35 years old. Aesthetic concerns would continue to be incorporated into all aspen harvests. A variety of management techniques would be employed in aspen and mixed aspen stands.

Why is the history of fire important on the NHAL?

Fire was the dominant disturbance factor for presettlement forests on the dry, sandy soils of the NHAL. Fires burned at various intensities and in small to large patches killing some trees while maintaining others. This dynamic gave us the diverse forests of red and white pine, aspen, white birch, and jack pine, as well as scattered patches of hemlock and yellow birch. Some species such as white birch and jack pine are difficult to regenerate without either fire or clearcutting and ground disturbance that create some of the conditions associated with fire. Without fire or other disturbance, natural succession is likely to lead to a forest dominated by red maple and balsam fir. Fires help create habitat for a variety of understory plants, trees, animals, and mushrooms. Returning fire to the landscape through controlled, prescribed burning would help restore and maintain the mixed forests. Due to on-going suppression of wildfires and to the difficulty of returning fire to the landscape on a large scale, the mixed forests of the NHAL are likely to be maintained and regenerated largely through timber harvests or other management activities.

What does old growth mean?

Forests change and age slowly and old growth characteristics take decades, even centuries, to develop. Old growth characteristics differ for various forest types, but may include old, large trees, downed woody debris, snag and den trees, tip-up mounds, supercanopy white pine trees, and a complex forest structure. It is important to understand that a site designated as old growth would probably have inclusions of young

forest over the short term. There are many types of old growth forest on the NHAL. Sites designated for old growth management would have a range of management approaches, from passive to active management.

A few relict forest sites exist on the NHAL that were not harvested in the cutover of the 1900s. These are mainly hemlock or white cedar stands that have been aged at 250 years or older. In contrast, the old growth pine and red oak sites are generally 80-120 years old. Some of these sites already have old growth characteristics, while others would begin to develop old growth characteristics in the next 30-60 years. Under the Preferred Alternative, some sites would be managed old growth, in which the primary management goal is the long-term development and maintenance of old growth characteristics. In these sites, limited but active land management including timber harvesting would be allowed. Some areas would be passively managed with no timber harvests. Currently, silvicultural practices designed to manage for old growth rely on adaptive management due to a lack of widely-agreed upon, reliable, and tested methods.

How would the forests and wetlands of the former Wild Areas be managed?

Under the 1982 Master Plan, three areas were designated Wild Areas: the Frank Lake, Partridge-Nixon, and Indian Creek Wild Areas. Under the new master planning rules, Wild Areas would not be designated on the NHAL. For recreational information on designations for Wild Resources, Non-Motor, or Semi-Remote Recreation Areas, see pages 15-17. Currently, Wild Areas generally prohibit clearcutting and have a lower level of forest management. Under the Preferred Alternative, the former Wild Areas would be managed according to the ecological capabilities and objectives laid out for each Land Management Area they fall into. This represents a change from the existing condition.

Passive management and low intensity management would occur on places in the NHAL, but not necessarily within the boundaries of the former Wild Areas, because parts of the former Wild Areas do not provide the best opportunity for passive or low intensity management from an ecological perspective. The location of old growth and passive management areas across the NHAL has been determined by an extensive scientific evaluation process based on the Community Restoration and Old Growth Assessment and the Biotic Inventory.

Under the Preferred Alternative, the parts of the former Wild Areas that fall into designated old growth or biotic inventory Focus Sites would be managed for old growth characteristics, wetland protection, or protection of other unique resources. Each Focus Site is described individually. Areas that do not fall into Focus Sites would be managed at a variety of intensities. The full range of management tools would be available in these areas, including clearcutting, selective harvest, thinning, ground disturbance, prescribed burning, and passive management of unforested wetlands.

How would forest management under the Preferred Alternative be different from the current management and trends of the NHAL State Forest?

The forest communities of the NHAL make up a complex and dynamic system. Several current forest trends are occurring regionally and would probably occur on the NHAL under most management scenarios. For instance, the forests of the NHAL were almost entirely cutover about 100 years ago prior to state ownership and have been harvested since then. On the whole, the forests are aging, early successional species such as aspen, white birch, and jack pine are slowly converting to other species, and large scale fire disturbances are lacking across the landscape.

Forest management is another important influence on forest composition and structure. Under the Preferred Alternative, several proposals would change aspects of the forest management on the NHAL. The 11 Land Management Areas are designed around ecological characteristics to guide landscape level management decisions. The Preferred Alternative has an increased emphasis on restoring a mixed, older red and white pine forest across the landscape. The Preferred Alternative also proposes designated sites for old growth characteristics. While older trees and patches of older forest have been maintained on the NHAL, no areas have been previously designated specifically for the enhancement of old growth

characteristics. Management in these areas would be described in the Master Plan, and some areas would be managed with a variety of techniques, including timber harvesting, prescribed burning, or passive management. Areas that would be designated for passive management range from small hemlock stands to larger areas of mixed older forest. The former Wild Areas, on the other hand, previously limited timber harvesting. As described on the previous page, the Wild Areas would be managed according to the ecological objectives of the Land Management Areas they fall into. Changes in Wild and Wilderness Lakes designations would have implications for management of the land areas around those lakes. (See page 11 for Wild and Wilderness Lakes.) The Preferred Alternative also offers more options for the use of prescribed fire.

How would water quality continue to be protected?

All land management activities would continue to protect the water quality of the NHAL's many lakes and rivers. Timber harvests incorporate Wisconsin's Forestry Best Management Practices for Water Quality (BMPs) which provide guidelines for water quality protection. Lakes and rivers have protective buffers along their shorelines.

Can we manage for ecological values, forest products, forest game habitat, red and white pine restoration, wetland protection, water quality, and wild resources at the same time?

Yes. Management of the state forest is designed to provide a range of benefits. Fortunately, the NHAL State Forest is large and diverse enough to provide many benefits at the same time in different places on the forest. The challenge is to create a balance between different values and benefits. These benefits are not necessarily mutually exclusive. For instance, restoration and maintenance of a pine forest requires some disturbance such as timber harvests which can generate forest products and wildlife habitat while protecting water quality.

Land Management on the NHAL

The land management section first describes property-wide information and then provides details on the eleven Land Management Areas on the NHAL. Descriptions of forest management across the landscape and in designated old growth and biotic inventory Focus Sites are given below. Information is included on ecosystem management, wildlife, endangered and threatened species, state natural areas, disturbance regimes, and lakes and streams. Then each of the Land Management Areas 1-11 is described. See Map 6: Preferred Alternative Land Management Areas. Each land management area contains the following information:

- Summary
- Description of Setting
- Short and Long Term Objectives
- Pie chart showing percent of area in each major cover type
- Management of Forest Types in the Forest Matrix
- Focus Sites (Old Growth and Biotic Inventory Sites)

Each land management area describes a unique landscape or management focus based on differences in soil, forest community, and ecological capability. These characteristics help shape the management direction for each area. Some of this information may look familiar from the NHAL Alternatives document. Short and Long Term Objectives

articulate the future desired condition of each area within that area's ecological capabilities. Because forests and landscapes change slowly, actions taken or not taken over the next 15 years may require 50-100 years to affect the forest as a whole.

The forest management section below (pages 29-34) describes the management of general forest types, grouped by dominant tree species. Major variations from this general management direction would be described under each management area. Within most management areas, Focus Sites were identified with good potential for old growth or management of other unique biological resources. These are listed as bulleted paragraphs, and originate in the Community Restoration and Old Growth Assessment (CROG) and Biotic Inventory (BI). The pie charts for each Land Management Area indicate the general abundance of forest communities.

NHAL Land Management Areas

- Area 1: Vilas Sandy Plains North
- Area 2: Vilas Sandy Plains Central
- Area 3: Oneida Sandy Plains
- Area 4: Big Arbor Vitae Loamy Hills
- Area 5: Manitowish Peatlands Wild Resources Area
- Area 6: Manitowish Peatlands
- Area 7: Rainbow Wetlands
- Area 8: Stone Lake Ruffed Grouse Habitat Management Demonstration Area
- Area 9: Sherman Lake Ruffed Grouse Habitat Management Demonstration Area
- Area 10: Lake Laura Loamy Hills
- Area 11: Winegar Moraines

General Forest Management on the NHAL

This section describes the forest management of the NHAL. About 78% of the state owned land is described as a "Forest Matrix" that includes a diversity of forest types and management objectives. The Forest Matrix includes any area not designated as a "Focus Site." About 22% of state owned land on the NHAL would be designated as Focus Sites. These areas would be managed specifically for old growth features in the uplands and wetland protection in the lowlands. The Forest Matrix section below describes the typical management of plant communities found on the NHAL, grouped by dominant tree species. When reading the text of Land Management Areas 1-11 (pages 39-61), please refer to the following information for details on forest management. For each Land Management Area, a pie chart indicates how much of the area is dominated by each main plant community described below. Some management units would have a greater emphasis on wetlands, aspen, northern hardwoods, or other forest types or management goals. Major differences from the general management described below would be noted under each area. For instance, the Manitowish Peatlands Wild Resources Area (Area 5) would be

passively managed. Therefore the descriptions below would not apply to Area 5. Focus Sites are listed individually in bulleted paragraphs under each Land Management Area.

In all cases, cooperative integrated forest management would be performed in annual or ongoing consultation with professionals in forestry, endangered resources, recreation, water quality, and wildlife. Decisions would be made through consultation and collaboration of scientists and resource managers based on the unique qualities of each site.

The Forest Matrix (78% of the NHAL):

The following information applies only to the general Forest Matrix as a whole, and not to individual Focus Sites that are described in bulleted paragraphs under each Land Management Area. The Forest Matrix contains a wide variety of site conditions and forest types, with a lot of variability across the landscape.

Each stand is classified by its dominant cover type. For instance, an aspen stand is a forest community with 50% or more of its basal area in aspen trees. Most stands, however, contain a mixture of various tree species. Additionally, stands with the same dominant cover type may be quite different. We use tree species as a common label for forest and wetland communities, but recognize that these communities are much more complex, and include understory shrubs and herbs, a variety of animals (from white-tailed deer to dragonflies, salamanders to sparrows), fungi, and soil bacteria. Typical management activities are described for each forest community type. The Forest Matrix would be managed at a variety of intensity levels.

Red Pine and White Pine: (11% of the Forest Matrix)

Under the NHAL Preferred Alternative, the objective would be to increase the dominance of older red and white pine in a mixed forest through a variety of techniques, such as selective harvest, retention of older trees in management areas, patch cuts of non-pine species within pine stands, or planting harvested areas. Existing pine plantations would be thinned about every 10-20 years to maintain growth and vigor. Red and white pines would be grown to biological maturity, 150-250 years, and then regenerated. Pine stands would typically be thinned for intermediate treatments and clearcut for regeneration treatments. Prescribed fires may also be utilized to regenerate pine forests. Mixed forests of pine, aspen, northern hardwoods, and red oak would be managed through a variety of techniques, depending on site conditions and management objectives. Patches or individual hemlock and jack pine trees in red and white pine stands would be maintained in various age classes. The red and white pine stands identified as old growth would be managed for old growth characteristics. In addition, small stands of old red pine and white pine within the general Forest Matrix would be allowed to grow until they reach old growth conditions, and may then be harvested to regenerate red and white pine.

Forests dominated by red pine and white pine make up 8% and 3% of the Forest Matrix, respectively. While this totals just 11%, these two species are found as very common associates throughout the upland forests of the NHAL. As one drives through or flies above the NHAL, the extent of the white and red pine becomes apparent. Red and white pine are found on sandy to sandy loam soils. Red pine in particular requires disturbance such as fire or timber harvest for reproduction. Many stands dominated by red and white pine contain a mixed forest with scattered aspen, white birch, red oak and northern hardwoods. About half of the red pine and 4% of the white pine-dominated stands on the NHAL are pine plantations. Red pine is more likely to be of plantation origin due to its high forest production value, shade intolerance, and high planting success. White pine is more likely to have natural origins due in part to insect and disease problems in plantations.



Red and white pine were the two dominant pre-European settlement species in the Pitted Outwash, with white birch and aspen as secondary species. Before European settlement, most red and white pines probably grew to be 100-200 years old in a patchwork of forest ages and types created by the complex interactions of fire, wind, insects, drought, and ecological succession on plant communities growing on a specific site.¹ Some individual pine trees grew to be 300 years old. In the cutover of the late 1800s and early 1900s, natural stands of red and white pine were almost completely removed. Red and white pine are highlighted in the Regional Ecology Assessment, the CROG Assessment, and the Biotic Inventory for their regional significance, opportunity for old growth and community restoration, and the potential for landscape level management. Red and white pine forests are valued for sustainable forest products, aesthetic qualities, and increasing regional biodiversity.

Aspen: (40% of the Forest Matrix)

Under the Preferred Alternative, the objective would be to manage for a slow decline in aspen dominance to be replaced primarily by red and white pine over the next 50-100 years. Aspen would be maintained as the most dominant tree species on the NHAL. Aspen currently dominates 40% of the Forest Matrix, and 33% of state owned land on the NHAL. The 33% of state owned land currently dominated by aspen is expected to decrease to about 28% over the next 50-100 years. On the NHAL, aspen would continue to be harvested and regenerate, primarily through clearcutting. The primary management strategy would be to harvest aspen stands but retain individual red oak, red pine, and white pine trees. The shift in aspen dominance would occur gradually, as stands mature from perhaps 60-70% aspen (with 30-40% in red oak, white birch, and red and white pine) to a stand with 40-50% aspen (and 50-60% red oak, white birch, and red and white pine) over the next 100 years. Alternative techniques such as selective harvest or disturbance to reduce aspen root-sprouting may also be tested. Today, most of the aspen stands on the NHAL are between 10 and 35 years old. Harvests of aspen would occur at the species' age of economic maturity, 45-65 years.



Photo by Eunice Padley

Aspen dominated stands are by far the most common forest type on the NHAL. Aspen is an early successional species that often occurs with white birch. It can thrive on a variety of sites, from dry to moist soils. Aspen exists as nearly pure stands and in a mixed forest with pines, red oak, white birch, and maples. It is particularly common due to the cutover of the late 1800s, the history of forest management since then, and its ability to grow well in different habitats. Aspen forests are valuable for providing a sustainable level of forest products as well as for their habitat value to forest game and non-game species. In presettlement forests in the Pitted Outwash, aspen was an important upland secondary species, after red and white pine and white birch. In the Winegar Moraines, aspen was relatively uncommon in presettlement forests. Aspen levels across the region are much higher than they were in presettlement forests and are declining slowly.

Red Oak: (7% of the Forest Matrix)

Under the Preferred Alternative, the objective would be to maintain current levels of red oak dominance. Red oak would be encouraged on sites with appropriate soil and other conditions. All areas managed for red oak would see old oak trees develop and then have the necessary disturbance, such as shelterwood and selective cuts, to regenerate this species. Oak is typically harvested through the shelterwood method. In a shelterwood



¹ Land surveyor notes from the 1860s confirmed that very sandy, flat areas were susceptible to more frequent canopy fires and had smaller trees, jack pines, and barrens. The rolling pitted outwash (the dominant landform on the NHAL) had less frequent canopy fires and was forested with nearly equal amounts of red and white pine along with many aspen and white birch trees. The east sides of lakes and wetlands often had the largest trees. Protected sites with slightly better sandy loam soils and only occasional canopy fires had white pine and white birch but also yellow birch and sugar maple along with scattered stands of eastern hemlock. (Community Restoration and Old Growth Assessment, 2001)

harvest, about 30-40% of the mature trees are harvested, depending on site characteristics, to allow for sunlight and the regeneration of young oak trees. After the young oak trees have regenerated, about 10-15 years later, the majority of the mature trees are harvested, while leaving some old trees for diversity and wildlife. Red oak would be managed at 90-150 years old, depending on site characteristics. A shelterwood harvest would appear more open than a selective harvest because sunlight must reach the ground to allow young oak trees to grow. On some sites, a red oak stand would be thinned to favor larger red oak trees that would produce more acorns before a shelterwood harvest is performed. Red oak stands may also be managed through clearcutting with reserves. The use of prescribed fire would also be considered where appropriate to facilitate seedling regeneration. Mixed pine-oak-northern hardwoods stands would be managed through a variety of techniques, depending on site conditions and management objectives. Today, most red oak stands on the NHAL are 80 to 90 years old.

Red oak is typically a component of disturbance dependent forests on sandy-loam soils. Red oak existed in presettlement forests as an uncommon secondary species. Red oak is shade intolerant and regeneration requires active management such as timber harvest, soil scarification, or prescribed burning. Red oak forests are valued for forest products and for wildlife habitat because acorns are an important food source for many animals. Deer browsing limits the regeneration of red oak.

White Birch: (5% of the Forest Matrix)

In the NHAL Preferred Alternative, the objective would be to increase or at least maintain the abundance of white birch across the forest. White birch is declining rapidly across the region, and it is unlikely that forest management would be able to significantly increase the dominance of white birch. White birch would be encouraged through a variety of management techniques. Typically, white birch would be clearcut along with aspen. Ground disturbance or prescribed fire may be used to favor white birch regeneration.

White birch is an early successional species. It is shade intolerant and requires disturbance such as timber harvest and scarification of the seedbed, or fire, for regeneration. White birch stands and individual trees are scattered throughout the forest, and are typically found together with aspen, or in a mixed forest with red and white pine, aspen, red oak, and northern hardwoods. In the red and white pine dominated presettlement forest of the Pitted Outwash, white birch was the most important secondary species, followed by aspen. It was uncommon in the Winegar Moraines. White birch is currently declining across northern Wisconsin due to old age, drought, and insect infestations. White birch is valued for its aesthetic character and for providing sustainable forest products and wildlife habitat. It is also favored by Native Americans for its bark.

Northern Hardwoods: (4% of the Forest Matrix)

Under the Preferred Alternative, the objective would be to increase the dominance of northern hardwoods on appropriate sites. The Winegar Moraines (Area 11), Lake Laura Loamy Hills (Area 10), and parts of the Big Arbor Vitae Loamy Hills (Area 4) are more likely to support northern hardwood forests than other parts of the NHAL. The Forest Matrix in suitable northern hardwoods sites would be managed for all aged hardwoods. All aged management means that the stand would not be harvested all at once; some trees would be selectively cut, while others would be left to grow. This produces a stand with trees of many ages. A typical selective harvest removes 25% to 50% of the canopy with each harvest, depending on site characteristics. Over the long term, this management creates a stand with trees of many different ages. To increase diversity within the forest, small gaps in the canopy may be created within a stand. In hardwood stands within a broader pine or aspen area, the emphasis would be placed on keeping a diverse mix of forest species in northern hardwood stands through selective management, group selection, shelterwood harvests, or passive management. Mixed pine-oak-northern hardwoods stands would be managed through a variety of techniques, depending on site conditions and management objectives. Northern hardwood stands in the Forest Matrix would be evaluated for possible management about every 15-20 years. On the NHAL, most northern

hardwood communities are 80 to 90 years old and are increasing very slowly as some aspen stands succeed to northern hardwoods.

Northern hardwoods (sugar maple, basswood, white ash, yellow birch, and red maple) are found on loamy soil and are shade tolerant. On the NHAL, many of the forests within the Pitted Outwash that are classified as northern hardwoods are actually a mixed forest of sugar maple, red oak, red and white pine, and aspen. Northern hardwoods were not significant presettlement species across most of the Pitted Outwash because of the sandy soils and frequent fire disturbance. However, northern hardwoods dominated the Winegar Moraines before European settlement. Sugar maple is valued over red maple for forest products. Northern hardwoods are also valued habitat for closed-canopy forest interior species.

Jack Pine: (4% of the Forest Matrix)

Under the Preferred Alternative, current levels of jack pine would be maintained on suitable sites. Jack pine stands on very dry sites would be clearcut at maturity, 50-80 years, and regenerated through disturbance (scarification or prescribed fire) and/or planting. In the past decade or two, jack pine declined steadily as a result of mature stands succeeding to red maple and pin oak at old age or dying from insect infestations. Many stands have been clearcut at maturity and regenerated in aspen or replanted with red pine instead of jack pine. An overall increase in the jack pine type would be emphasized throughout the NHAL on suitable sites. In particular, Areas 1 and 2 and the uplands of Area 7 are likely to have significant jack pine components. Some lowland jack pine sites may also be regenerated through prescribed fire.

Just over half of the jack pine is of plantation origin. Jack pine is found in dry to very dry sandy soils and is adapted to very frequent fires. In northern Wisconsin, large areas of jack pine were established by the Civilian Conservation Corps (CCC) in the 1930s and 1940s. This period was followed by fire suppression which limited the regeneration of jack pine stands. Jack pine stands are declining and have been widely salvaged recently, due to mortality from insect infestations and old age. Restoration opportunities for jack pine on appropriate sites were identified in the CROG Assessment. Regeneration of jack pine faces many challenges but can be achieved by planting, prescribed burning, or harvesting timber and then scarifying the soil to create some effects of fire. Jack pine is a fast-growing species valued for sustainable forest products and habitat for many wildlife species.

Hemlock-Hardwoods: (<1% of the Forest Matrix)

Under the Preferred Alternative, the objective would be to maintain existing hemlock-hardwoods and encourage regeneration where appropriate. On the NHAL, almost all hemlock-hardwoods are older stands. Most hemlock would be passively managed. Any management in hemlock-hardwood stands would be designed to promote existing hemlock, selecting out other species and creating regeneration conditions for hemlock or desired hardwoods. Any such management would be planned by an integrated team of WDNR scientists and managers. Many scattered areas of hemlock-hardwoods exist throughout the NHAL but make up less than one percent of most Land Management Areas.

Logging and fires eliminated most of the eastern hemlock about 100 years ago. Today, hemlock-hardwood abundance is stable. Regeneration of hemlock is a significant management challenge, due to lack of seed sources and high browse pressure. This forest type is valued for forest-interior species and its aesthetic qualities.

Unforested Wetlands: (15% of the Forest Matrix)

Under the Preferred Alternative, the objective would be to maintain high quality unforested wetlands. Unforested wetlands would have no active management and would continue to be protected throughout the NHAL, in both the Forest Matrix and the Focus Sites. Large peatlands of muskeg, bog, and fen define the Manitowish Peatlands (Areas 5 and 6) and Rainbow Wetlands (Area 7). Smaller open wetlands are found across the pitted landscape of the NHAL. Unforested wetlands are typically stable, though some are succeeding to tamarack and black spruce. Unforested wetlands may

experience temporary frozen-condition access across the surface. Wisconsin's Forestry Best Management Practices for Water Quality (BMPs) provide for water quality protection during forest management practices.

Unforested wetlands provide habitat for many species, including rare species. They also serve to protect water quality in nearby lakes and streams. Seventy-nine percent of the rare plants documented on the NHAL grow primarily in wet habitats, illustrating the biodiversity significance of abundant high-quality lakes, streams, and wetlands. Wild rice beds can be found on many lakes. Harvesting of wild rice is an important cultural tradition. Many unforested wetlands form the core of sites identified in the NHAL Biotic Inventory as having particular ecological significance. Like all the wetlands on the NHAL, these Biotic Inventory sites would continue to be protected.

Forested Wetlands: (5% of the Forest Matrix)

Forested wetlands are mainly made up of black spruce and tamarack, with smaller areas of northern white cedar, swamp hardwoods (black ash), and alder. Under the Preferred Alternative, the objective would be to maintain high quality forested wetlands across the NHAL. Some of the black spruce and tamarack stands may be managed at 100-150 years on productive sites to maintain the forest type while protecting sensitive wetland attributes. Methods for harvesting black spruce and tamarack include clear cuts and strip cuts while the wetland is frozen. Other forested wetland types such as northern white cedar and swamp hardwoods (black ash) are much less common on the NHAL. These areas would be passively managed, unless an integrated team of scientists and managers prepares a plan for management to regenerate those species.



Wetlands represent the vital transition between the dry habitats of the uplands and the surface waters of lakes and streams. Forested wetlands have slow succession, little harvest, and low potential for the land to support other types of forests. Over time there has been a shift from tamarack to later-successional black spruce. Restoration of tamarack is one of the community restoration opportunities identified in the CROG Assessment and Biotic Inventory. Forested wetlands are valued for watershed protection and habitat for a variety of rare species.

Additional information on management techniques:

- The principles of sustainable forestry and ecosystem management form the foundation for management of the NHAL.
- Big Tree Silviculture would continue to be used in the management of the NHAL. Big Tree Silviculture maintains older white pine, red pine, northern hardwood, hemlock-hardwood, and red oak on high quality sites.
- Monitoring and evaluation is an essential component of the WDNR's integrated ecosystem management system, particularly for use in adaptive management. An on-going monitoring program would be expanded for the NHAL.
- If significant exotic invasive species are detected, they may be controlled through manual, biological, or chemical means.
- Forest pest control measures would be implemented as needed for insects including the jack pine budworm and saratoga spittlebug. Responses to significant pest outbreaks would be evaluated by an interdisciplinary team of scientists and communicated to the public.
- Herbicides may be used to reduce competition on young trees from shrubs.
- Aesthetic management techniques would continue to be incorporated into management practices.
- All management operations would continue to follow Wisconsin's Forestry Best Management Practices for Water Quality (BMPs).
- Fire suppression measures would be implemented as needed on the NHAL.
- Lake and stream habitats may be modified for fisheries management in lakes and streams.

Focus Sites (Old Growth and Biotic Inventory Sites) (22% of the NHAL):

The Land Management Areas contain a total of 49,700 acres of Focus Sites (22% of the NHAL) that would be managed specifically for old growth, aquatic protection, or other ecological values under the Preferred Alternative. These sites are individually listed in bulleted paragraphs under each Land Management Area. See Map 7: Focus Sites. The sites were identified and ranked in either the Community Restoration and Old Growth (CROG) report or the NHAL Biotic Inventory. The numbers next to the name of the site refer to these reports. The “BI” sites come from the NHAL Biotic Inventory, and “CROG” sites come from the CROG Assessment. Both reports are the result of years of data collection and evaluation by scientists and land managers. The CROG and Biotic Inventory sites listed as Focus Sites in the Preferred Alternative include most of the sites ranked high to moderate. These sites were evaluated for inclusion by an integrated team of scientists and managers. Of the total 49,700 acres, 32,870 acres are forested uplands, 12,800 acres are unforest wetlands, and 4,030 acres are forested wetlands.

Focus Sites	Acres	% of NHAL
Forested Uplands	32,870	15%
Unforested Wetlands	12,800	5%
Forested Wetlands	4,030	2%
TOTAL	49,700	22%

Small, Scattered Old Growth	Acres	% of NHAL
Forested Uplands	4,700	2%

In addition to the sites described individually within each area, the CROG report identified about 4,700 acres of small, scattered old growth sites greater than 80 years old. These sites fall into the overall Forest Matrix and would be managed for old growth characteristics using a combination of extended rotations, old growth management techniques, or passive management. The 4,700 *upland* scattered old growth sites combined with the 32,870 acres of *upland* Focus Sites make up the 17% of the NHAL that would be managed for old growth characteristics. These sites contain old red pine, white pine, red oak, northern hardwoods, and hemlock-hardwoods. A very small amount of upland Focus Sites would be managed for other ecological features, such as pine barren restoration. A number of aquatic sites were identified in the Biotic Inventory, providing habitat for many rare species. Lakes, streams, and wetlands, abundant on the NHAL, would continue to be protected under the Preferred Alternative.



Management practices for old growth and old growth characteristics are currently being developed by WDNR scientists and other researchers. Silvicultural practices designed to manage for old growth rely on adaptive management due to a lack of widely agreed-upon, reliable, and tested methods. Authorized management techniques are described for each Focus Site (old growth or biotic inventory site) by Land Management Area.

Ecosystem Management

Managing for sustainable ecosystems involves considering the composition, structure and function of the communities on the NHAL. Managing the forest in an ecological context gives us a better understanding of how complex and unique the communities are on the NHAL. Composition simply refers to the different types of plants, animals, fungi and other organisms that live in an area. Structure is the physical arrangement of the trees, shrubs, grasses, and flowers in the understory. Function includes the biological, chemical, and physical processes at work in the forest. Given the complexity of a functioning ecosystem, a variety of professionals continually provide input on managing the NHAL’s dynamic forests. The Preferred Alternative proposes management of a diversity of communities at varying successional stages for a variety of species.

Wildlife

The Regional Ecology assessment determined that the NHAL, because of its location on the Pitted Outwash landform, would best meet the habitat requirements for those plant and animal species that prefer forests dominated by a mixture of pine, aspen, red oak, and white birch in all their successional stages.

Since habitat is the key to plant and animal abundance, the NHAL plan focuses on managing habitat rather than setting population goals. The determination of specific population goals for species such as white-tailed deer, black bear, fisher, bobcat, otter, and gray wolves is outside the scope of this plan.

Forests throughout the NHAL would be managed to maintain a diverse vegetative structure and composition. Both early and late successional habitats would occur on the NHAL. White and red pine would slowly increase but common habitats such as aspen and red oak would remain abundant. Rare and uncommon habitats would be protected.

Forest Game: The major forest game species include white-tailed deer, black bear, ruffed grouse, American woodcock, and snowshoe hare. Populations of these species would be maintained by managing for mixed forests of aspens, oaks, birches, and pines. Ruffed grouse habitat would be featured in two ruffed grouse demonstration areas and would occur throughout the 28% of the NHAL that would be dominated by aspen in the next 50-100 years.

Waterfowl: Wetlands, lakes, streams, and wild rice beds would be protected. Mature forest along waterways would benefit cavity nesters such as wood ducks and mergansers. Three waterfowl flowages would be maintained and periodically inspected for dam safety.

Bald Eagle, Osprey, and Common Loon: The 900 lakes of the NHAL provide habitat for some of the densest concentrations of breeding bald eagles, osprey, and common loons in Wisconsin. Habitats for these species would continue to be protected. Special management guidelines protect nest trees for eagles and osprey.

Grassy Forest Openings: Small openings dominated by European grasses and native bracken grassland communities cover about 0.5% of the NHAL. These communities would be maintained when they occur in forests managed for the aspen community and would be eliminated when they occur in forests managed for mature and old growth characteristics. A several hundred-acre bracken grassland community would be maintained at Johnson Lake Barrens.

Songbirds: Several bird species rely on the pine habitat that is widespread across the NHAL and expected to increase in the future, including the evening grosbeak, pine siskin, red crossbill, and pine warbler. The presence or absence of these species in the NHAL is largely dependent upon annual continental population shifts in response to weather and cyclic food availability.

Several bird species of concern, including the yellow-bellied flycatcher, boreal chickadee, gray jay, white-winged crossbill, cape may warbler, and connecticut warbler, are found most often in black spruce and tamarack stands. An integrated management review process would provide for the protection of habitat for these bird species.

Raptors: Raptors include hawks and owls. On the NHAL, the northern goshawk, red-shouldered hawk, and merlin are special concern or state threatened raptor species. While management guidelines have been approved for bald eagles and osprey, guidelines have not yet been developed for the raptors listed above. Until such guidelines are cooperatively developed, consultation would continue to be sought from

WDNR research personnel to address potential impacts on a case-by-case basis. When guidelines are approved, they would be incorporated into forest management practices.

Endangered and Threatened Species

The Preferred Alternative meets the Property Goal (page 4) of identifying and protecting endangered and threatened resources. Numerous endangered, threatened, and special concern species were identified through inventories on the NHAL. All species on the NHAL that are identified as endangered, threatened, and special concern, along with their specific habitats, would be protected. Management actions occurring on the state forest would be done in a manner which does not result in a direct taking of any known endangered or threatened resource.

According to the NHAL Biotic Inventory, about $\frac{3}{4}$ of the rare plants and $\frac{1}{2}$ of the rare animals on the NHAL are found in wetland habitats. The high number of rare aquatic animals is a reflection of the abundance of high-quality lakes, streams, and wetlands on the property. The NHAL hosts many of Wisconsin's largest known populations of shore sedge, marsh willow-herb, and leafy white orchis. Rare mosses and liverworts (bryophytes) and lichens are also found on the NHAL, the majority of them in wetland habitats. A suite of butterfly species including the bog copper is associated with peatlands. The yellow rail is one rare bird that lives in the unforested wetlands of the NHAL. The wetlands of the NHAL would continue to be protected.

The wood turtle is a state threatened species that nests along sandy riverbanks in the NHAL. Wisconsin's Forestry Best Management Practices for Water Quality address most of the wood turtle's management needs. Timber sale design would keep equipment, and especially landings, away from sandy nesting sites. In addition, small sandy openings next to streams would not be planted with pines.

State Natural Areas

State Natural Areas (SNAs) are part of a statewide system of sites identified for the purposes of ecological research, education, and to assure the full range of ecological diversity for future generations. SNAs are unique in state government, because they can serve as stand alone properties or they can be designated on other properties. The SNA System cooperates with nearly every public landowner where some management goals are shared. For example, a parcel purchased as a State Wildlife Area because it contains excellent wildlife habitat may also harbor a high quality plant community. Wildlife Management can continue to meet its wildlife goals, while cooperating with the SNA program to help meet its goals.

This type of agreement allows for multiple benefits from the same parcel of land or water body. Some areas of the NHAL identified for protection as important aquatic, wetland, old growth, or biotic sites to meet important State Forest goals, would be designated State Natural Areas in the final Master Plan. SNA designation would be determined in the next phase of the planning process through additional analysis and public involvement.

Disturbance Regime

Prior to European settlement, the region around the NHAL was characterized by large patches of mature pine forest with a variety of secondary species such as white birch, aspen, hemlock and sugar maple. The frequency of natural disturbance (fire and windthrow) was the main influence on the forested landscape. At present, human management and chance events such as fire, tree fall (canopy gap formation) and catastrophic windthrow alter ecosystem composition, structure and function. The impact that any one or a combination of these factors have on the forest varies by habitat and vegetation cover type.

The importance of fire in different forest types depends on a number of conditions including species composition, age, successional stage, climate and microclimate, insect and disease patterns and landscape pattern. Fire was an important function on the NHAL in pine and aspen forests, and to a lesser degree in northern hardwood forests. It recycles nutrients, maintains competing understory vegetation, and creates a more favorable environment for species that rely on its attributes. Studies have shown that in pine forests, stand initiating fires return about every 50 to 100 years. Fire control efforts suppress fires in order to protect people's communities and property and to protect forest resources. Fire suppression has resulted in forest community changes. Decreasing the frequency and severity of fire can reduce tree regeneration of some species, and increase the fuel loads in the forest (the amount of material in an area that could burn). As these changes are recognized, prescribed fires would be an alternative tool to what naturally occurred years ago in the ecosystem balance. Tree species that are favored by fires, such as jack pine and white birch, also benefit from timber harvests and ground disturbances that create some of the conditions of fire.

Another disturbance regime that occurs on the NHAL is windthrow. Wind can blow over single trees or small groups of trees, creating natural gaps that provide greater diversity. Wind events occur over a large part of the forest. In northern hardwoods, windthrow has return intervals of 1,200 years for stand initiating effects.

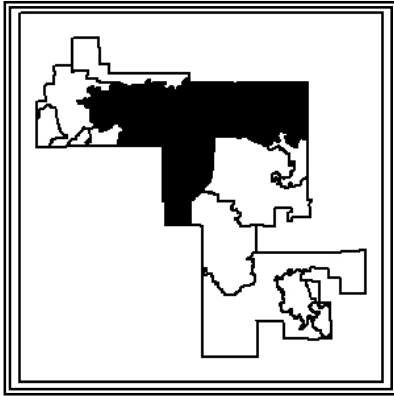
Lakes and Streams

The density of kettle lakes in the Pitted Outwash, formed by receding glaciers, is among the highest in the world. The area also forms the headwaters for the Wisconsin and Flambeau-Chippewa Rivers drainage basins. Aquatic ecosystem protection is one of the highest conservation priorities in this region,² and excellent opportunities exist on the NHAL. Lakes and streams cover 12% of the surface of the NHAL. The NHAL is fast becoming one of the last places in the region with large undeveloped lakes. The lakes and streams in the NHAL are treasured for their high water quality and provide a variety of habitats, supporting diverse fish, amphibian, invertebrate, and plant communities, with many rare species. The majority of rare plants and animals on the NHAL were identified in wet habitats. The NHAL holds the state's largest known populations and large portions of the total number of populations of many aquatic plants. The NHAL contributes to one of the highest known regional concentrations of bald eagle, osprey, and common loon, which depend on open lakes and rivers.

Under the Preferred Alternative, the NHAL would protect and manage a diverse array of aquatic features including seepage lakes, drainage lakes, spring lakes, spring ponds, small streams, and selected stretches of larger streams such as the Manitowish and Wisconsin Rivers.

² NHAL Biotic Inventory

Area 1: Vilas Sandy Plains North



Description of Setting

The rolling pitted outwash topography, sandy soils, and abundant lakes in this large area (73,100 acres of state owned land) represent the most common characteristics of the NHAL. This area, along with Areas 2 and 3, makes up the Vilas-Oneida Sandy Plains ecological landscape. Historically, fire was a significant disturbance factor in this area. Stand-replacing fires had cycles every 50-100 years, but some trees survived over 300 years. Some fires burned the understory without killing the pine trees, creating a more open forest. At European settlement, this area was mostly covered with white and red pine. White birch and aspen were found secondarily, with some patches of jack pine and northern hardwoods. Within forested wetlands, tamarack was predominate, black spruce was common, and hemlock was a minor species.

Today, aspen dominates many areas, with red oak, white birch, red pine, and jack pine found in significant amounts, as well. The vegetation can be described as a forest of various cover types with large and small patches of different tree species dominant in different parts of the landscape. White pine exists in most stands of aspen as scattered large trees and understory seedlings or saplings. The habitat types in this area are typically characterized by an understory of shrubs such as hazelnut, junberry, low sweet blueberry, sweetfern, and maple-leaf viburnum, and herbs such as wild lily-of-the-valley, bracken fern, grasses and sedges, and big leaf aster. Drumlins, particularly common west of Trout Lake, have a slightly richer soil suitable for red oak with mixed red and white pine and aspen. The drumlins typically have an understory of low sweet blueberry, maple-leaf viburnum, and big leaf aster. Unforested wetlands are found throughout the area, and provide habitat for many rare species. Lakes and streams are common in this area. The northeast corner of this area contains the Johnson Creek and Salsich/Siphon Springs area, a complex of softwater springs, spring-fed streams, and wetland communities. Area 1 overlaps with the western part of the former Partridge-Nixon Wild Area. The forests in this area would be managed along with the rest of Area 1. (See page 27 for how the Wild Areas are changing under the Preferred Alternative.)

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is a mixed forest dominated by older red and white pine (150-250 years old) with aspen, white birch, jack pine, and older red oak as important secondary species. Drumlins with slightly richer soil would be managed for older red oak and red and white pine. Old growth characteristics would be enhanced in designated Focus Sites and small scattered old growth sites through a variety of active and passive management techniques. A diversity of forested and unforrested wetlands would be maintained.

The short-term (50 year) objective is to increase the dominance and age of red and white pine across most of the mixed forest as opportunities arise. Pine trees in aspen, red oak, white birch, jack pine, northern hardwood and hemlock stands would be retained, and continue to increase in abundance. Aspen would decline

Summary for Area 1: Vilas Sandy Plains North

- Characteristic sandy, pitted outwash topography.
- 73,100 acres of state owned land in this area.
- Opportunity to restore large areas of red and white pine forest community in the long term.
- Opportunity to manage for a slow decline in aspen and add to the diversity of aspen stands.
- Conservation of forested and unforrested wetlands that provide habitat for many rare species and help protect water quality.
- Management for old growth and other unique resources on about 6% of this area (4,500 acres) in Focus Sites. Also, management for small, scattered old growth sites.

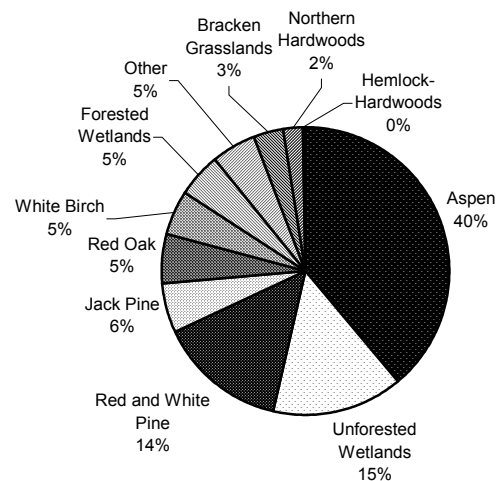
slowly but remain abundant. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

Management of Forest Types in the Forest Matrix (68,600 acres, which is 94% of Area 1)

Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 1. The pie chart indicates how much of Area 1 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus Sites. The management of individual old growth and biotic inventory sites is listed below.

In Area 1, note the abundance of aspen (40%), red and white pine (14%), and jack pine (6%). Unforested wetlands make up 15%, while forested wetlands make up 5% of the area.

Current Land Cover in Area 1



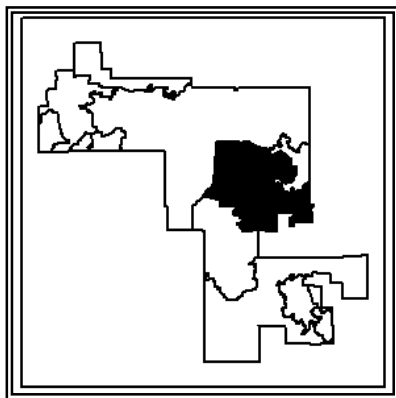
Focus Sites--Old Growth and Biotic Inventory Sites (4,500 acres, which is 6% of Area 1)

- Camp Lake and Pines (BI 44) includes Camp Lake, a small unnamed lake and an upland area with large white and red pines. All shorelines would be protected from development and the large pines on the isthmus between them would be passively managed. The surrounding forest would be managed for old growth red and white pines.
- Cathedral Point (CROG 21B) is an old growth site with scattered red pine and white pine mixed with old red oak and hardwoods on a peninsula in Trout Lake. This site is a popular picnic area near the Trout Lake Station. The area would be passively managed, with an exception for maintaining public access and public use areas.
- Devine Lake/Mishonogan Creek (BI 45) includes Devine Lake, Mishonogan Creek and surrounding wetlands. Management of upland forested sites would favor long lived species, especially conifers. Forested and unforested wetlands would be passively managed.
- High Lake (CROG 12AB) is a 95-year old white pine site with a hemlock inclusion and some northern hardwoods. The management goal is to perpetuate this area in white pine along with associated species and to enhance the old growth characteristics of the site. This site is rich enough to contain hemlock and northern hardwood associates. Some characteristics of fire and wind disturbance would be created through management activities as necessary to maintain white pine and associate species.
- Johnson Creek and Pines (BI 19) supports a mature forest of jack pine, red pine, and black spruce with an understory that includes bracken fern, blueberries, wintergreen, and barren-strawberry. Management would incorporate or create many conditions of stand replacing fire on this dry site to maintain the dry pine forest community. Jack pine and associated species would be encouraged.
- Johnson Lake and Barrens (BI 18) contains a shallow drainage lake and a barrens area. The bracken grassland community of sweetfern, blueberries, bracken fern, and barren-strawberry would continue to be maintained through prescribed fire, brushing, and timber harvests. The undeveloped drainage lake and wetlands would continue to be protected. Management of surrounding forested communities (jack pine, red pine, black spruce) would incorporate community restoration objectives.
- Jute Lake (CROG 22B) is an 85-year old red oak, white birch and northern hardwood site with two small hemlock stands. Management would perpetuate an old growth northern hardwoods and red oak forest. Selective harvests would retain large trees and encourage reproduction of red oak and hardwoods. Aspen management on the surrounding site would continue favoring an oak and hardwood forest. The two small hemlock stands would be passively managed.

- Manitowish River (BI 12) is a river corridor and wetland area between Hwy K and Island Lake. Any management near the river would protect aquatic and wetland features, water level changes, and shoreline integrity. Black ash within this area would be passively managed.
- Papoose Creek (CROG 10AB, BI 9) consists of mature (115-year old) predominantly natural and planted red and white pines with scattered younger red pine, jack pine, aspen, white birch, red oak, and red maple. The management goal is to perpetuate an old growth community of red and white pine along with associated species. Recent management was focused on thinning to natural stand structure along Hwy K. Management actions for old growth characteristics may include a combination of passive management, planting, extended rotations, and prescribed fire.
- Sherman Lake (BI 7) consists of the lake and surrounding forest, composed of aspen, white birch and red maple. Several small stands of swamp conifers are present also. The upland forest would be managed for aspen and white birch while protecting wetlands and open water areas. The lowland types would be passively managed.
- Trout Lake West (CROG 35BC) is a 90-year old red oak and mixed pine site on the west shore of Trout Lake. Management through timber harvests or prescribed fire would maintain this site in old growth red oak and red and white pine. As aspen and jack pine are harvested, red oak and red and white pine in these stands would be favored, gradually decreasing the dominance of aspen and jack pine.

Note: The BI and CROG numbers refer to sites described and mapped in the Biotic Inventory and Analysis of the NHAL (BI) and the Community Restoration and Old Growth Assessment (CROG). These reports can be ordered through the NHAL Master Plan Support Literature Order Form on page iv.

Area 2: Vilas Sandy Plains Central



Description of Setting

The pitted outwash topography, well-drained sandy soils, and abundant lakes in this 36,900 acre area represent the most common characteristics of the NHAL. Glaciers helped shape the landscape, forming drumlins and lakes, and depositing sand and gravel outwash. This area, along with Areas 1 and 3, makes up the Vilas-Oneida Sandy Plains ecological landscape. Historically, fire was a significant disturbance factor in this Area. Stand-replacing fires had cycles every 50-100 years, but some trees survived over 300 years. Some fires burned the understory without killing the pine trees, creating a more open forest. At European settlement, this area was mostly covered with white and red pine. White birch and aspen were found

secondarily across the area with patches of jack pine and northern hardwoods. Within forested wetlands, tamarack was predominate, black spruce was common, and hemlock was a minor species. The matrix vegetation can be described as a forest of different cover types with large and small patches of different tree species dominant in different parts of the landscape. Today, aspen dominates many areas, with red oak, white birch, red pine, and jack pine found in significant amounts, as well. Red oak is more common in this area than in any other management area. White pine exists in most stands of aspen as scattered large trees and understory seedlings or saplings. The habitat types in this area are typically characterized by an understory of shrubs such as hazelnut, juneberry, low sweet blueberry, sweetfern, and maple-leaf viburnum, and herbs such as wild lily-of-the-valley, bracken fern, grasses and sedges, and big leaf aster. Unforested wetlands are found throughout the area, and provide habitat for many rare species. Area 2 overlaps with the former Frank Lake Wild Area. The forests in this area would be managed along with the rest of Area 2. (See page 27 for how the Wild Areas are changing under the Preferred Alternative.)

Objective: Long Term and Short Term

The long term (100 year) objective for this area is a mixed forest dominated by older red and white pine with aspen, red oak, white birch, and jack pine as important secondary species. Areas with slightly richer soil would be managed for red oak with red and white pine. Old growth characteristics would be enhanced in designated areas and small scattered old growth sites through a variety of active and passive management techniques. A diversity of forested and unforested wetlands would be maintained.

The short-term (50 year) objective is to increase red and white pine dominance across most of the mixed forest as opportunities present. Red and white pine trees in aspen, red oak, white birch, jack pine, northern hardwood and hemlock stands would be retained, and continue to increase in abundance. Most sites with early successional forest types such as aspen, jack pine, and white birch would be maintained. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

Summary for Area 2: Vilas Sandy Plains Central

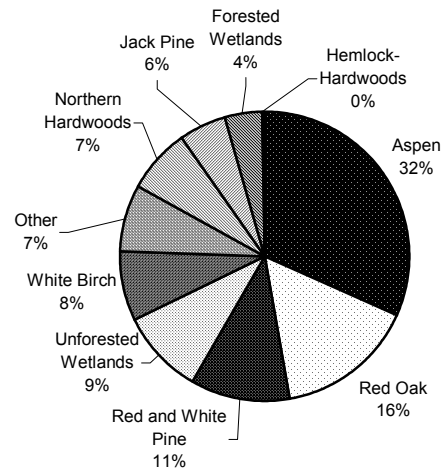
- Characteristic sandy, pitted outwash topography.
- 36,900 acres of state owned land in this area.
- Opportunity to restore large areas of red and white pine forest community in the long term.
- Opportunity to manage for a slow decline in aspen and add to the diversity of aspen stands.
- Opportunity to maintain and enhance significant red oak forests.
- Conservation of forested and unforested wetlands that provide habitat for many rare species and help protect water quality.
- Management for old growth and other unique resources on about 19% of this area (7,200 acres) in Focus Sites. Also, management for small, scattered old growth sites.

Management of Forest Types in the Forest Matrix (28,700 acres, which is 81% of Area 2)

Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 2. The pie chart indicates how much of Area 2 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus Sites. The management of individual old growth and biotic inventory sites is listed below.

In Area 2, note the abundance of aspen (32%), red oak (16%), red and white pine (11%), white birch (8%), northern hardwoods (7%), and jack pine (6%). Unforested wetlands make up 9%, while forested wetlands make up 4% of the area.

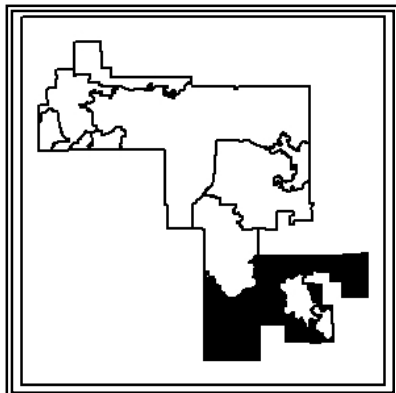
Current Land Cover in Area 2



Focus Sites--Old Growth and Biotic Inventory Sites (7,200 acres, which is 19% of Area 2)

- Allequash Lake (CROG 15AB, BI 34) is a 130-year old white pine site with 83-year old red oak and northern hardwoods. The objective of this area would be old growth characteristics and the maintenance of the closed canopy white pine and red oak forest. Existing aspen and white birch would be managed to maintain these species as secondary types with decreasing abundance. South of the access road to Allequash Lake, the forest would be passively managed. Other areas south, north, and east of this passive area could be actively managed.
- Aurora Lake and Wetlands (BI 26, 27, 28) combines the natural values of Aurora Lake, a drainage lake with several types of wetlands and upland pine forest; Mary Davis Reis Bog, an open bog; and Frank Lake, a deep seepage lake and frost pocket bracken grasslands. Passive management would occur except in the frost pocket where occasional brushing may occur to keep the area open.
- Firefly Lake (CROG 7AB) is a 70- to 80-year old mixed pine and red oak site. Management would favor maintaining and enhancing the old growth characteristics of the red and white pine site. The red oak management would favor maintaining old growth characteristics in areas dominated by oak with a mixture of pines and hardwoods. Management activities designed to produce characteristics of fire-disturbance ecology would be used as necessary to perpetuate red and white pine and red oak.
- Lost Canoe Lake (CROG 13AB, BI 31, 32, 33) contains a variety of old growth areas. Part of the area is a 90-year old mixed forest of red oak, northern hardwoods, aspen and white birch with 120-year old white pines surrounding several lakes. Another part is an old growth mixed hemlock and conifer swamp. This large site would see management intensities vary, with priority areas for scenic and recreational uses. The Biotic Inventory sites BI 31, 32, and 33 would be passively managed for old growth characteristics. The areas outside of the BI sites would be actively managed for old growth characteristics to maintain red oak and maintain and enhance white pine. Northern hardwoods would have some active management in low use areas.
- Mann Lake North (CROG 8AB) is a 92-year old white pine and red oak site. The management goal would be to perpetuate an old growth community of white pine and red oak along with associated species. Management activities designed to produce characteristics of fire-disturbance ecology would be used as necessary to perpetuate white pine and red oak.

Area 3: Oneida Sandy Plains



Description of Setting

The pitted outwash topography, well-drained sandy soils, and abundant lakes in this 33,200 acre area represent the most common characteristics of the NHAL. Glaciers helped shape the landscape, forming drumlins and lakes, and depositing sand and gravel outwash. This area, along with Areas 1 and 2, makes up the Vilas-Oneida Sandy Plains ecological landscape. Historically, fire was a significant disturbance factor in this Area. Stand-replacing fires had cycles every 50-100 years, but some trees survived over 300 years. Some fires burned the understory without killing the pine trees, creating a more open forest. At European settlement, this area was mostly covered with white and red pine. White birch and aspen were found

secondarily across the area with patches of jack pine and northern hardwoods. Within forested wetlands, tamarack was predominate, black spruce was common, and hemlock was a minor species. The matrix vegetation can be described as a forest of different cover types with large and small patches of different tree species dominant in different parts of the landscape. Today, aspen dominates about half the area, with red oak, white birch, red pine, and jack pine found in significant amounts, as well. White pine exists in most stands of aspen as scattered large trees and understory seedlings or saplings. The habitat types in this area are typically characterized by an understory of shrubs such as hazelnut, junberry, low sweet blueberry, sweetfern, and maple-leaf viburnum, and herbs such as wild lily-of-the-valley, bracken fern, grasses and sedges, and big leaf aster. Unforested wetlands are found throughout the area, and provide habitat for many rare species. Due to its large size, this area was and continues to be a matrix of different tree species and communities.

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is a mixed forest dominated by older red and white pine with aspen, red oak, white birch, and jack pine as important secondary species. A diversity of forested and unforest wetlands would be maintained. Areas of existing old growth pine, northern hardwoods, hemlock-hardwoods and red oak would be maintained and expanded where possible. Opportunities to maintain and expand the white birch and oak type would be sought wherever they occur. A portion of the area would be maintained in early successional forest types to replace older stands that have reached the end of their biological lifespan. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

The short-term (50 year) objective is to increase red and white pine dominance across most of the mixed forest as opportunities occur. Management would retain and increase pine components on aspen, red oak, white birch, jack pine, northern hardwood and hemlock stands as secondary objectives. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

Summary for Area 3: Oneida Sandy Plains

- Characteristic sandy, pitted outwash topography.
- 33,200 acres of state owned land in this area.
- Opportunity to restore large areas of red and white pine forest community in the long term.
- Opportunity to manage for a slow decline in aspen and add to the diversity of aspen stands.
- Conservation of forested and unforest wetlands that provide habitat for many rare species and help protect water quality.
- Management for old growth and other unique resources on about 4% of this area (1,150 acres) in Focus Sites. Also, management for small, scattered old growth sites.

Management of Forest Types in the Forest Matrix (32,090 acres, which is 96% of Area 3)

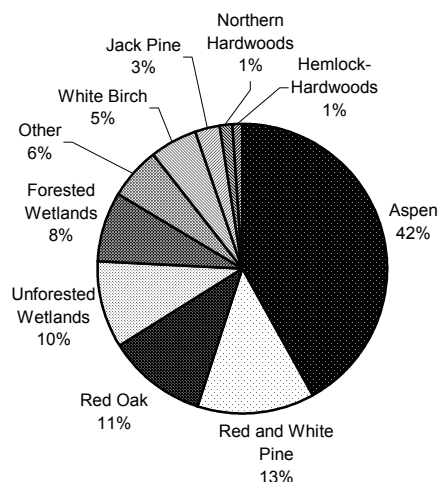
Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 3. The pie chart indicates how much of Area 3 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus Sites. The management of individual old growth and biotic inventory sites is listed below.

In Area 3, note the abundance of aspen (42%), red and white pine (13%), red oak (11%). Unforested wetlands make up 10%, while forested wetlands make up 8% of the area.

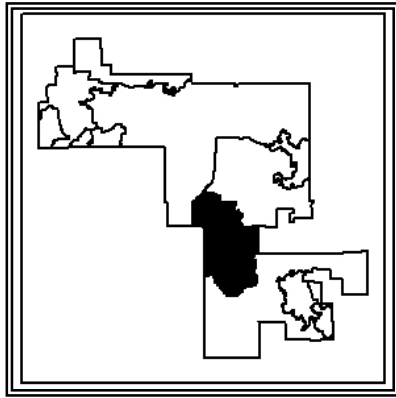
Focus Sites--Old Growth and Biotic Inventory Sites (1,150 acres, which is 4% of Area 3)

- Helen Lake (CROG 27B) is a 100-year old red and white pine site mixed with 90-year old red oak and 80-year old aspen. The site includes a small (20 acre) hemlock-hardwood stand. Management would favor the expansion of hardwood and hemlock-hardwood forests, as well as maintaining and enhancing the mature red and white pine component. Management would perpetuate the old growth communities and increase the old growth characteristics of the site. Existing aspen would be managed over time to convert it to mature red and white pine.
- Tomahawk Lake Hemlock (CROG 33B, BI 54). The majority of this site supports mature hemlock-hardwoods. It is located adjacent to the McNaughton prison and has some of the best hemlock reproduction on the NHAL. Current management of the site would emphasize the maintenance of the hemlock-hardwood type largely through passive management.
- Two Lakes Pine and Oak Forest (CROG 30B, BI 56) is composed of a mixed forest of mature red and white pine and oak. A windstorm blew through a small portion of the area in the summer of 1999, and the downed wood (mostly large pine) was not salvaged. Part of the site would be passively managed, and part would be actively managed.
- Windpudding Lake (BI 57) consists of Windpudding Lake itself along with a 400-foot zone around the shoreline. Management would emphasize protection of the aquatic communities within the lake basin.

Current Land Cover in Area 3



Area 4: Big Arbor Vitae Loamy Hills



Description of Setting

This area represents 25,000 acres of state owned land with varied topography and an assortment of different forest types. At a large scale, this is one of the more ecologically intact forested portions of the NHAL. Many of the white and red pine and northern hardwoods stands possess or are developing old growth characteristics. The land is level in some areas and rolling in others. Lakes are common but lowlands, while certainly present, are not as widespread as in other areas on the NHAL. Area 4 is characterized by a mixed matrix of tree species with northern hardwoods, aspen, oak and white birch dominant on the uplands but slowly being replaced by white pine, balsam fir and red maple through succession. There are some areas of

mature red and white pine also, and these species are found extensively throughout the area as important secondary species. While there are significant northern hardwood areas, hemlock-hardwoods are relatively scarce. The habitat types in this area are typically characterized by a moderately developed shrub layer of hazelnut, low sweet blueberry, junberry, and maple-leaf viburnum, and herbs such as wild lily-of-the-valley, bracken fern, grasses and sedges, and big leaf aster. Historically, fire was a significant disturbance factor within this area, as it was in almost all areas on the State Forest. Wind throw was and is another important disturbance factor, especially in areas with wetter soils. Sporadic wind events also occurred on drier upland sites as well and played a vital role in shaping forest succession. At European settlement, the upland areas contained several different forest types including northern hardwoods, hemlock-hardwoods, white and red pine, and even some jack pine/scrub oak. White birch, red maple, aspen and oak were found secondarily across the region. Within the forested wetlands, tamarack and black spruce were predominant, with some scattered cedar.

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is a mixed forest dominated by older red and white pine and northern hardwoods with aspen, red oak, white birch, and jack pine as important secondary species. Large-scale ecosystem management with increased forest block size, stand age, and conifer component would enhance the ecological characteristics of this area. A diversity of forested and unforested wetlands would be maintained. Old growth characteristics would be enhanced through a variety of active and passive management techniques. Opportunities to maintain and expand the white birch and oak type would be sought wherever they occur. A portion of the area would be maintained in early successional forest types.

The short-term (50 year) objective is to increase red and white pine and northern hardwood dominance across most of the mixed forest as opportunities occur on suitable sites. Pine components on aspen, red oak, white birch, jack pine, northern hardwood and hemlock-hardwood stands would be retained and increased as secondary objectives. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

Summary for Area 4: Big Arbor Vitae Loamy Hills

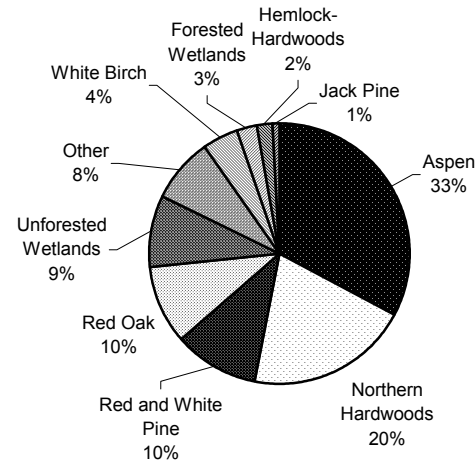
- Mixed forest on sandy-loamy soils including hardwoods, pines, aspen, and red oak.
- 25,000 acres of state owned land in this area.
- Opportunity to restore a large scale, older aged mixed red and white pine, red oak, and hardwoods forest in this central area.
- Opportunity for large-scale forest community connectivity.
- Management for old growth and other unique resources on about 43% of this area (10,800 acres) in Focus Sites. Also, management for small, scattered old growth sites.

Management of Forest Types in the Forest Matrix (14,100 acres, which is 57% of Area 4)

Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 4. The pie indicates how much of Area 4 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus Sites. The management of individual old growth and biotic inventory sites is listed below.

In Area 4, note the abundance of aspen (33%), northern hardwoods (20%), red and white pine (10%), and red oak (10%). Area 4 has slightly loamier soils than Areas 1, 2, and 3. This accounts for more northern hardwoods and red oak within the Forest Matrix. Unforested wetlands make up 9%, while forested wetlands make up 3% of the area.

Current Land Cover in Area 4

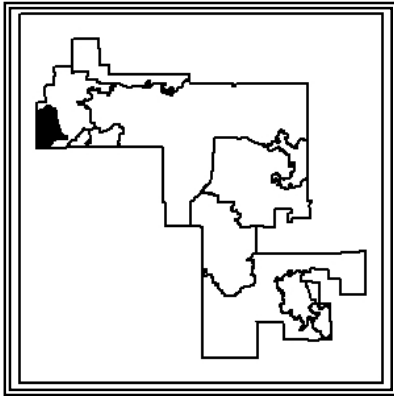


Focus Sites--Old Growth and Biotic Inventory Sites (43% of Area 4; 10,800 acres)

- Big Arbor Vitae/Mann Lake (CROG 11AB, BI 36, 37, 47) contains mostly northern hardwoods with some areas of mature large pine. Several small, undeveloped lakes are also present. The northern hardwoods are located on marginally productive lands. The northern hardwoods would be managed as necessary to maintain northern hardwoods and enhance old growth characteristics. Management would maintain scattered large white pine and enhance white pine and yellow birch where possible. The oldest white pines on the forest are found in this site—those areas would be passively managed. In other portions of this site, pines would be enhanced through active management where possible to maximize the old growth characteristics of these stands. Other associated species such as red oak and birch would be maintained as secondary species.
- Carroll Lake (CROG 26B) is a northern hardwood and red oak site with a popular ski trail running through part of it. Several large, 150-year old red oak are scattered throughout the area. The oak is very near biological maturity, with numerous individuals starting to die out. This area was recently thinned in a commercial timber sale. The objective here would be to manage for an oak dominated forest with old growth characteristics through prescribed fire or timber harvests. The soils and habitats of this area are well suited to oak management.
- Buffalo Lake (CROG 29B) contains mixed red and white pine stands with scattered small wetland areas. Much of the pine is of plantation origin. The uplands would be actively managed for red and white pine with old growth characteristics.
- Bittersweet Lakes (CROG 16AB, most of BI 38) is a 160- to 180-year old white pine site with old growth hemlock and 90-year old northern hardwoods. The site contains the existing Bittersweet Lakes State Natural Area and is partly included within the proposed Bittersweet Lakes Non-Motor Area. (See page 17 for recreation in this area.) Within the CROG boundary, the site would be passively managed for old growth characteristics.
- Mud Creek Springs (CROG 9AB, BI 39) contains the headwaters of Mud Creek and the surrounding lowlands and uplands. The lowlands are large and diverse and would be passively managed. The uplands contain some stands of mature red and white pine that would be managed to maintain and enhance old growth characteristics. A portion of the area contains young aspen trees with scattered large white pine. Management here would increase the component of large white pine in this area over time. Timber harvests or prescribed fire may be used to manage this site.

- Sweeney Lake (CROG 20AB, BI 40) consists of Sweeney Lake as well as some adjacent uplands to the east. Sweeney is a large, undeveloped drainage lake. The upland area to the east consists mainly of a hemlock hardwood stand and a mixture of oak and white birch dominated forests. The hemlock stand has had some significant wind damage and was not salvaged. Management here would emphasize the retention of hemlock on this site through passive management of the hemlock areas. Monitoring would take place to verify adequate hemlock regeneration and to study the effects of the windthrow. The rest of the area would be actively managed to maintain as much red oak and white birch as possible.
- Hemlock Lake (CROG 19AB, BI 51) contains Hemlock Lake and the surrounding uplands. A popular ski, hiking and biking trail runs through a large portion of the area. There are some mature hemlock-hardwoods and mixed pine stands on the uplands. Several significant windthrows have affected large portions of the area. The timber in these areas was subsequently salvaged. Management would seek to maintain and enhance the hemlock hardwood and pine types and to maximize their old growth characteristics. The Biotic Inventory site would be passively managed, while the remainder of the area would be actively managed.

Area 5: Manitowish Peatlands Wild Resources Area



Description of Setting

The Manitowish River flows through the heart of this 6,150 acre area. Together, Areas 5 and 6 make up one of the largest peatlands in Wisconsin, with a diversity of wetland habitats and species. The landscape of the Manitowish Peatlands Wild Resources Area is mostly flat and wet, with patches and islands of uplands within the vast peatland complex. The wetlands flow from the Winegar Moraines south through the Manitowish Peatlands, and then into adjacent public properties such as the Turtle-Flambeau Scenic Waters Area, Lac du Flambeau Reservation, and the Chequamegon Unit of the National Forest. The soils are mostly very poorly drained organic peat with some areas of sands or loamy sands. The wetlands are open and

mostly free of woody vegetation, although areas of black spruce and tamarack do occur. Black ash swamp and white cedar forest are also scattered throughout. The uplands contain aspen and red and white pine stands with some mixed hardwoods. Some upland islands contain old growth red and white pine stands. Other upland areas have pine plantations or aspen stands. Historically, both fire and floods, with the water table rising in wet years and dropping in drought years, were the major influences on the vegetation. Upland stand-replacing fires had cycles every 50-100 years, but some trees survived over 300 years. Fires also maintained the open treeless bog habitat. Bog, poor fen, and tamarack forest are the historical wetland vegetation, and are represented today much as they probably were before European settlement.

This area is the existing Manitowish River Wilderness Area (renamed the Manitowish Peatlands Wild Resources Area under the Preferred Alternative to fit revised master planning categories). The boundary is slightly different because the existing snowmobile trail along the southern border would not be allowed within the Wild Resources Area. Wild Resources Areas provide remote, non-motorized recreation in areas where natural ecological process dominate and evidence of human impact is low. No active management is permitted in a Wild Resources Area, except for safety, to control invasive species, or for restoration work specified in the Master Plan.

Objective: Long Term and Short Term

The long-term (100-year) and short term (50-year) objective for this area is to allow natural ecological process to dominate. The high quality open sedge meadow/bog, shrub and forested wetland system would be maintained through passive management for ecological, water quality and habitat values. The vegetation would be characterized by open areas of sedge meadow and bog mixed with old wetland forest of tamarack, black spruce, white cedar, and black ash interspersed with upland islands and peninsulas of old growth pine, hemlock, and northern hardwoods.

Management of the Manitowish Peatlands Wild Resources Area

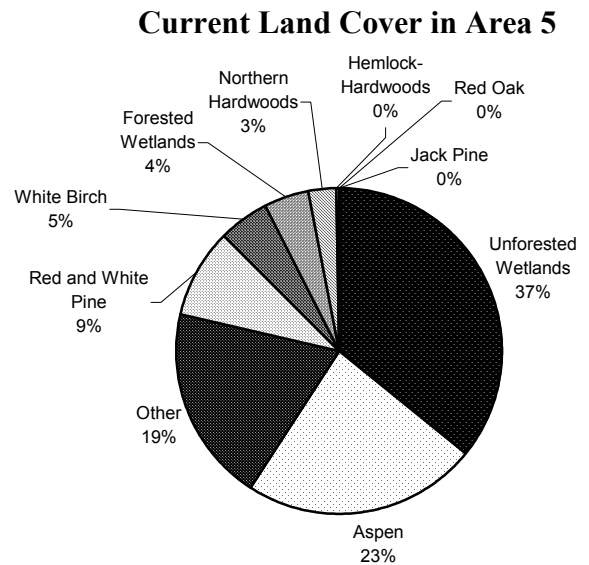
The Manitowish Peatlands Wild Resources Area would continue to be passively managed. Timber harvests would not occur, and timber would not be salvaged after storms. Limited

Summary for Area 5: Manitowish Peatlands Wild Resources Area

- The only Wild Resources Area proposed for the NHAL.
- About 6,150 acres of state owned land in this area.
- Opportunity to maintain the high quality open sedge meadow, bog, shrub and forested wetland system for ecological, water quality and habitat values.
- Conservation of wetland habitat for many rare species.
- Passive management throughout this area for wetlands, old growth red and white pine, and other forest types.
- Management for unique resources and old growth on 100% of this area in Focus Sites.

active restoration work to enhance the natural aesthetics of the area may be specified in the Master Plan. Restoration of old roads to a natural-looking appearance may be authorized. If exotic invasive species are found in significant numbers, they may be controlled through manual, biological, or chemical control methods. Any management decisions on invasive species would be made by an integrated team of resource managers. While this area contains many of the same forest types as the other areas on the NHAL, they would *not* be managed according to the descriptions laid out in the Forest Management – Forest Matrix section (pages 29-34).

Wetlands make up 41% of this area. Without disturbance, natural succession could cause open bogs and poor fens to convert to tamarack, while tamarack may in turn convert to black spruce. Without significant disturbance from a fire or flood, an increase in forested wetlands and a decrease in open wetlands is expected. Aspen makes up 23% of the area. Current levels of aspen dominated stands in this area would slowly decrease to become dominated by pines and hardwoods in the next 100 years. Based on habitat type and natural succession patterns in this area, regeneration without active management would likely lead to a forest dominated by sugar maple, red maple, yellow birch, white pine, and possibly hemlock. Regeneration would depend on the abundance of seed sources and on disturbance from fire, windthrow, and disease. Red and white pine (9% of the area) are found in patches of old growth forest as well as some areas with pine plantations. Some areas of mixed forest contain red and white pine with scattered occurrences of aspen/white birch, red oak and northern hardwoods. Existing red and white pine would be allowed to grow old. Over time, a decrease in red pine is expected due to the low likelihood of significant fire disturbance.



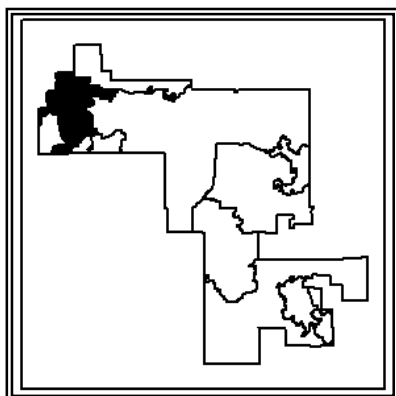
The entire area is a designated Biotic Inventory site, and part of it is a designated old growth site.

Focus Sites--Old Growth and Biotic Inventory Sites (6,150 acres, which is 100% of Area 5)

- Frog Lake (CROG 1A) is a 120-year old red pine and white pine site around Frog Lake with 30-year old aspen in the understory. Like the rest of this area, the Frog Lake site would be passively managed. It would continue to serve as a reference for old growth management techniques in red and white pine forests in other areas.
- Manitowish River Wilderness Area (BI 5) encompasses all of Area 5, the Manitowish Peatlands Wild Resources Area. This entire area would be passively managed except to protect safety, control invasive species, or for restoration work specified in the Master Plan.

Area 6: Manitowish Peatlands

(excluding the Manitowish Peatlands Wild Resources Area)



Description of Setting

This 19,500 acre area is part of one of Wisconsin's largest peatlands. The topography is nearly level throughout. It is characterized by large expanses of lowland communities, including open bog, poor fen, black spruce, swamp hardwoods and tamarack. Many of the lowland areas contain sandy "islands" that are forested mainly with scattered red, white and jack pine. Soils are mostly very poorly drained organic peat. Some areas have sandy and loamy sand soils. Historically, fire was a significant disturbance factor within this area, as it was in almost every area on the NHAL. In addition to fire, wind throw was and continues to be a major influence due to the shallow roots of trees associated with high water table variations. At European settlement,

the northern portion of uplands in Area 5 were dominated by hemlock, white birch, and white pine, while uplands areas to the south were dominated by red pine, white pine, and aspen. Within the forested wetlands, tamarack was predominant, with black spruce, swamp hardwoods and white cedar forest also present in significant numbers. Today, this area is a matrix of different tree species and communities. Unforested wetlands dominate half of the area. Forested wetlands are such as tamarack and black spruce are scattered across the landscape. Aspen, white birch, red pine and white pine are found in significant amounts on the uplands. There are also areas of northern hardwoods and hemlock-hardwoods. Most stands are a mixed mosaic of tree species.

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is to maintain the high quality open sedge meadow/bog, shrub and forested wetland system primarily for ecological, water quality and habitat values. A diversity of forested and unforested wetlands would be maintained. The small patches of existing old growth pine and hemlock-hardwoods would be maintained, and expanded where possible. A portion of the area would be maintained in early successional forest types to replace older stands that have reached the end of their biological lifespan. Scattered hemlock and northern hardwood stands would be maintained and expanded as opportunities exist. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

The short-term (50 year) objective is to manage for old growth characteristics across most of the mixed forest as opportunities occur. Pines and hardwoods on aspen, white birch, northern hardwood and hemlock stands would be retained and increased as secondary objectives. Wetland communities' objectives would be met through passive management in many areas. Some black spruce and tamarack stands would be regenerated through active management. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

Management of Forest Types in the Forest Matrix (12,800 acres, which is 66% of Area 6)

Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 6. The pie chart on the following page indicates how much of Area 6 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus

Summary for Area 6: Manitowish Peatlands

- Opportunity to maintain the high quality open sedge meadow, bog, shrub and forested wetland system for ecological, water quality and habitat values.
- About 19,500 acres of state owned land in this area.
- Conservation of wetland habitat for many rare species.
- Management for old growth and other unique resources on about 34% of this area (6,700 acres) in Focus Sites. Also, management for small, scattered old growth sites.

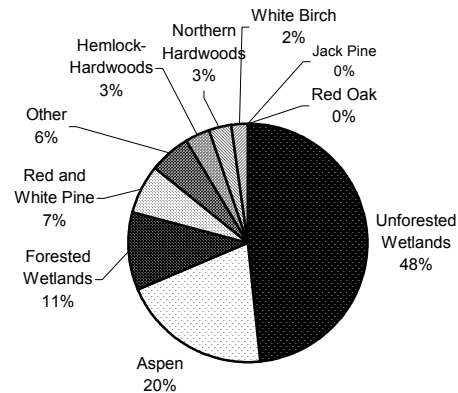
Sites. The management of individual old growth and biotic inventory sites is listed below.

In Area 6, note the abundance of unforested wetlands (48%), and forested wetlands (11%). In addition, aspen makes up 20% of the area and red and white pine make up 7%.

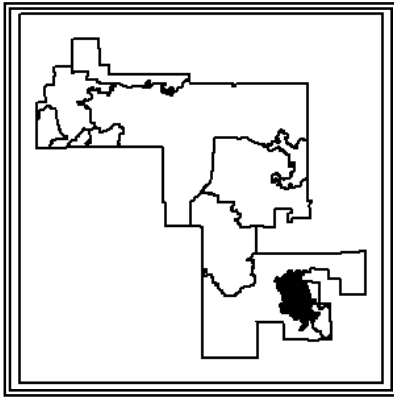
Focus Sites--Old Growth and Biotic Inventory Sites (6,700 acres, which is 34% of Area 6)

- DuPage Lake (BI 3) is a large complex of wetland communities with scattered small patches of old growth hemlock-hardwood forest and old white pine forest. The majority of the area is suited to passive management. Some very limited areas may benefit from some thinning and regeneration activities. Any harvest activity that would take place in this area would have all weather road access to protect the integrity of the wetland complex.
- North Bass Lake West (CROG 18AB, BI 2) falls partly within the Manitowish Peatlands and partly within the Winegar Moraines (Area 11). North Bass Lake West consists of several stands of hemlock-hardwoods and northern hardwoods with some white pine. The hemlock is old aged and the northern hardwood stands are mature. Many forested wetland inclusions occur west and southwest of North Bass Lake. The management goals are to promote the old growth character and look for opportunities to manage for a forest dominated by large trees, diverse structure and a diversity of tree species and ages. The hemlock areas and forested wetlands would be passively managed. The far eastern side and southwest corner of the site would be actively managed for hemlock regeneration.
- Plunkett Lake (CROG 14AB, BI 4) is an old growth hemlock-hardwood stand with scattered white pine and 85-year old red oak located north and east of Plunkett Lake. The management goal would be to perpetuate the old growth character, promoting hemlock and other long lived species in a diverse mixture.
- Toy Lake (BI 8) is a large wetland complex of hardwood swamp, white cedar swamp and alder thicket surrounding Toy Lake. Within this wetland site are scattered “islands” or ridges that support mature hemlock-hardwoods. This site would be considered for protective designation of all the wetland communities and old growth stands. All wetland communities and old growth stands would be maintained through passive management. Management of outlying aspen, white birch and northern hardwood stands would maintain and enhance those types.

Current Land Cover in Area 6



Area 7: Rainbow Wetlands



Description of Setting

This 8,300 acre area is characterized by large expanses of lowland communities, including open bog, sedge meadow, shrub swamp, black spruce, and tamarack. This predominance of wetland communities lends this ecological area its name. The topography is predominantly level, but ranges from level to rolling in places. Many of the lowland areas contain sandy “islands” that are forested mainly with scattered red, white and jack pine. Historically, fire was a significant disturbance factor within this area, as it was across the NHAL. In addition to fire, wind throw was and continues to be major influence due to the shallow root systems of trees in high water-table areas. At European settlement, white pine, red pine, and white birch were the

predominant upland trees. Aspen, yellow birch, and hemlock were found secondarily. Within the forested wetlands, tamarack and black spruce were predominate, with white cedar as a secondary component. This area was and continues to be a matrix of different tree species and communities. Today, lowland types dominate most of the area, with aspen, white birch, jack pine, red pine and white pine found in significant amounts on the uplands. This area includes the western portion of the former Indian Creek Wild Area. The forests in this area would be managed along with the rest of Area 7. (See page 27 for how the Wild Areas are changing under the Preferred Alternative.)

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is to maintain the high quality open sedge meadow/bog, shrub and forested wetland system primarily for ecological, water quality and habitat values. A diversity of forested and unforested wetlands would be maintained. The upland objective is a mixed forest dominated by older red and white pine with aspen, white birch, and jack pine as important secondary species. Old growth characteristics would be enhanced through a variety of active and passive management techniques. A portion of the area would be maintained in early successional forest types to replace older stands that have reached the end of their biological lifespan.

The short-term (50 year) objective is to increase red and white pine dominance across most of the mixed forest as opportunities occur. Pine components on aspen, red oak, white birch, jack pine, northern hardwood and hemlock stands would be retained and increased as secondary objectives. A diversity of high quality forested and unforested wetlands would continue to be maintained. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

Management of Forest Types in the Forest Matrix (1,400 acres, which is 17% of Area 7)

Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 7. The pie chart indicates how much of Area 7 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus Sites. The management of individual old growth and biotic inventory sites is listed below.

Summary for Area 7: Rainbow Wetlands

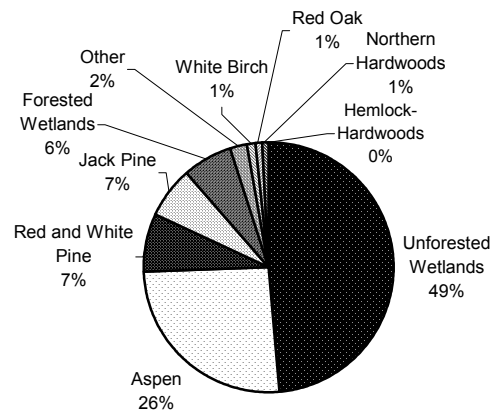
- Opportunity to maintain the high quality open sedge meadow, bog, shrub and forested wetland system for ecological, water quality and habitat values.
- About 8,300 acres of state owned land in this area.
- Conservation of wetland habitat for many rare species.
- Management for unique wetlands and old growth on about 83% of this area (6,900 acres) in Focus Sites. Also, management for small, scattered old growth sites.

In Area 7, note the abundance of unforested wetlands (49%), and forested wetlands (6%). In addition, aspen makes up 26% of the area, red and white pine make up 7%, and jack pine dominates 7%.

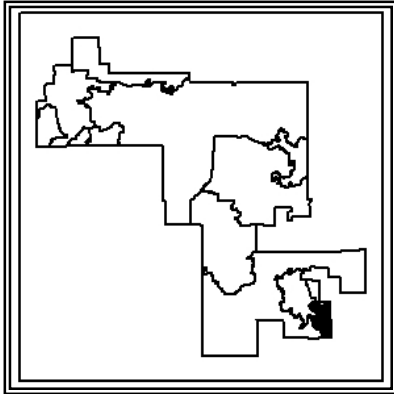
Focus Sites--Old Growth and Biotic Inventory Sites (6,900 acres, which is 83% of Area 7)

- Big Swamp (BI 61) is a vast peatland complex with some sandy high ground patches, particularly around the edges of the area. The lowland portion of the site would be passively managed. The upland fringe areas contain mostly young aspen, which would be managed over time for a mixed aspen, white birch, and pine forest. The area also contains some cedar dominated swamps, which would be passively managed.
- Rainbow Wetlands (BI 60) is a large complex of wetland communities with “islands” and ridges of sandy soils. The area has been recently impacted by significant wind events. Most of these areas were subsequently salvaged to encourage pine regeneration. The vast majority of the area would be passively managed.
- Swanson Lake and Pines (CROG 32B, BI 62) is a relatively small area of lowland communities and mature oak and pine types, with some young aspen regeneration. The area contains an old growth red and white pine and red oak site (CROG 32B) that would serve as a reference site. This area was significantly impacted by a windstorm in the summer of 1999. The salvaged areas of 32B would be actively managed to promote red and white pine, while the unsalvaged areas would be passively managed. Management outside the reference areas would promote older red pine and white pine. The wind storm of 1999 has set succession back in this area and would result in a longer time frame to reach the goal of a late-successional forest in places. Existing young aspen would be managed over time for mature pine.

Current Land Cover in Area 7



Area 8: Stone Lake Ruffed Grouse Habitat Management Demonstration Area



Description of Setting

This 3,700 acre area is predominantly aspen in the uplands, with considerable lowland area. The topography is varied and runs from nearly level in some areas to rolling in others. Lowlands are common but lakes are more scattered. The area would continue to be managed as a habitat management demonstration area for ruffed grouse and other forest game species. This area has been managed in the past as a ruffed grouse habitat experimental area. The focus of this experimental area was to regenerate aspen with various patch clearcuts to maximize the age class distribution and placement of the patches.

Area 8 is characterized by a mixture of aspen in various age classes.

Other timber types are present in significant amounts as well,

including northern hardwoods, hemlock-hardwoods, some white birch, and forested wetlands. Some very limited areas of mature red and white pine also exist, and these species can be found throughout the area as important secondary species. There are significant wetland areas, both forested and non forested. Scattered stands of northern hardwood and hemlock hardwood can also be found. Historically, fire was a significant disturbance factor within this area, as it was in almost every area on the State Forest. Wind throw is another very important disturbance factor, especially given the many wet and high water table areas in this area. Many ancient tip-up mounds can be observed throughout the area. At European settlement, the upland areas primarily supported white and red pine and white birch. Aspen, yellow birch, and hemlock were found secondarily in the area. Within the forested wetlands, tamarack, cedar, and black spruce swamp conifer forests were well distributed. This area includes the eastern portion of the former Indian Creek Wild Area. The forests in this area would be managed along with the rest of Area 8. (See page 27 for how the Wild Areas are changing under the Preferred Alternative.)

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is ruffed grouse habitat management demonstration area. The forest management objective is a mixed forest dominated by aspen in a variety of age classes and patch sizes. Other associated species would be managed along with the aspen, to the extent that they do not interfere with adequate aspen regeneration. A diversity of forested and unforest wetlands would be maintained. The single Biotic Inventory site would be managed according to the objectives described below. Patches of existing mature pine, northern hardwoods, hemlock-hardwoods, white birch and red oak would be maintained or slightly decreased over time. Representatives of these types would likely always be present in some significant amount. The overall goal would be to maintain this area in early successional forest types over time.

The short-term (50 year) objective is to maintain or increase aspen dominance within the mixed forest. A diversity of aspen age classes would be maintained, with scattered older red and white pine, red oak, and northern hardwood trees.

Summary for Area 8: Stone Lake Ruffed Grouse Habitat Management Demonstration Area

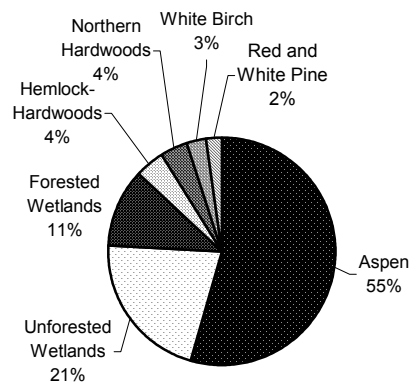
- Opportunity to provide a demonstration area for ruffed grouse habitat management.
- 3,700 acres of state owned land in this area.
- Opportunity to provide a diversity of aspen age classes with scattered red and white pine and red oak trees.
- Conservation of forested and unforest wetlands that provide habitat for many rare species and help protect water quality.
- Management for old growth and other unique resources on about 7% of this area in Focus Sites. Also, management for small, scattered old growth sites.

Management of Forest Types in the Forest Matrix (3,450 acres, which is 93% of Area 8)

In Area 8, the objective of a ruffed grouse habitat management demonstration area would be met through smaller, more frequent aspen clearcuts than in other parts of the NHAL. Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of aspen on the NHAL. The pie chart on this page indicates how much of Area 8 is currently grouped into each dominant forest type. The percentages include both the Forest Matrix and the Focus Site. The management of the Focus Site is listed below.

In Area 8, note the abundance of aspen, which dominates 55% of the area. Unforested wetlands (21%), and forested wetlands (11%) are also common.

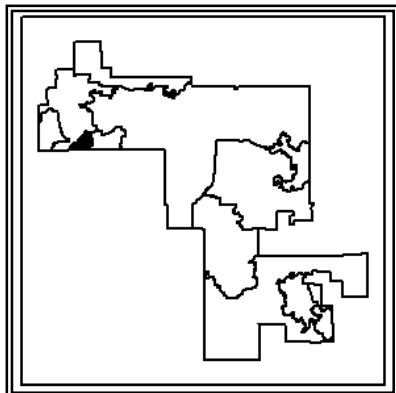
Current Land Cover in Area 8



Focus Sites--Old Growth and Biotic Inventory Sites (250 acres, which is 7% of Area 8)

- Stone Lake Pines (BI 65) contains a string of small islands of mature 130-year old red pine surrounded by lowland communities of bog, spruce and tamarack. The site contains the boundary of the current Stone Lake Pines State Natural Area. Both the wetlands and the upland islands would be passively managed.

Area 9: Sherman Lake Ruffed Grouse Habitat Management Demonstration Area



Description of Setting

This 1,900 acre area is predominantly an aspen forest that has been managed for ruffed grouse habitat for over 15 years. Its sandy soils and rolling topography are similar to the much of the Vilas-Oneida Sandy Plains. Lowlands are common but lakes are more scattered. Historically, fire was the dominant disturbance factor. At European settlement, the upland areas were mostly covered with white and red pine. White birch and aspen occurred secondarily across the region. Today aspen dominates the area. This area began to be managed for ruffed grouse habitat in the mid 1980s when Forestry staff planned to reduce the size of the aspen areas and break up the aspen age classes with multiple harvests.

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is ruffed grouse habitat management demonstration area. The mixed forest would be dominated by aspen in a variety of age classes and patch sizes. Other associated species would be managed along with the aspen, to the extent that they do not interfere with adequate aspen regeneration. Wetland diversity would continue to be maintained. Patches of existing mature pine, northern hardwoods, hemlock-hardwoods, white birch and red oak would be maintained or slightly decreased over time. Representatives of these types would likely always be present in some significant amount. The overall goal would be to maintain this area in early successional forest types over time. The short-term (50 year) objective is to increase aspen dominance for ruffed grouse habitat across most of the mixed forest as opportunities occur.

Summary for Area 9: Sherman Lake Ruffed Grouse Habitat Management Demonstration Area

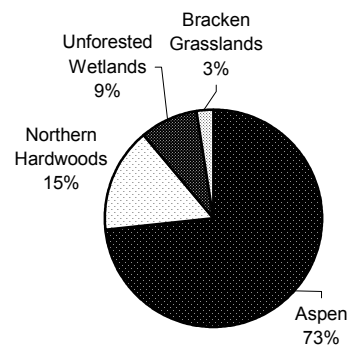
- Aspen management for ruffed grouse and other forest game.
- 1,900 acres of state owned land in this area.
- Opportunity to provide a diversity of aspen age classes with scattered red and white pine and red oak trees.
- No designated old growth or unique resources sites.

Management of Forest Types in the Forest Matrix (100% of Area 9)

In Area 9, the objective of a ruffed grouse habitat management demonstration area would be met through smaller, more frequent aspen clearcuts than in other parts of the NHAL. Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of aspen on the NHAL. The pie chart indicates how much of Area 9 is currently grouped into each dominant forest type.

In Area 9, note the abundance of aspen, which dominates 73% of the area. In Area 9, the objective of a ruffed grouse habitat management demonstration area would be met through small aspen clearcuts performed more frequently than in other parts of the NHAL. Northern hardwoods dominate 15%, and unforested wetlands 9%.

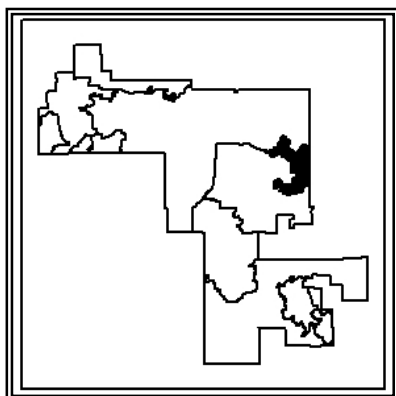
Current Land Cover in Area 9



Focus Sites (Old Growth and Biotic Inventory Sites) (0% of Area 9)

- None

Area 10: Lake Laura Loamy Hills



Description of Setting

This 7,400 acre area is a unique one on the NHAL. The sugar maple, basswood, aspen, yellow birch, and hemlock forests are in or approaching mature forest conditions. This is different from most of the NHAL, which features sandy soils and aspen/red and white pine/oak forests. The topography of the Lake Laura Loamy Hills is predominantly rolling, but ranges from undulating to hilly. Soils are mostly well drained sandy loams. Loamy sands and organic deposits also are common. Historically, fire was the major disturbance factor. Stand replacing fires probably had 100-300 year cycles. Wind was a factor in disturbance in the older forest, especially where the local landscape was moister and protected. At European settlement, the

upland areas were mostly covered with white pine, white birch and yellow birch. Aspen, red pine and sugar maple were the important secondary species. Within the forested wetlands, tamarack and spruce predominate, with hemlock, white pine and jack pine secondary. Today's upland forests are dominated by old growth northern hardwoods and hemlock-hardwoods, with aspen, red oak, and white birch. The habitat types in this area are typically characterized by a moderately developed understory of shrubs such as hazelnut, maple-leaf viburnum, and low sweet blueberry, and herbs such as wild lily-of-the-valley, bracken fern, grasses and sedges, and big leaf aster. Small forested wetlands of tamarack, black spruce and white cedar are also found in this area.

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is to maintain and enhance the existing stands of old growth character northern hardwoods. Some stands would be managed to promote northern hardwood species and age diversity and maintain stand health and vigor. A diversity of forested and unforested wetlands would be maintained. A portion of the area would be maintained in early successional forest types to replace older stands that have reached the end of their biological lifespan. Scattered hemlock and northern hardwood stands would be maintained and expanded as opportunities exist. Old growth characteristics would be enhanced through a variety of active and passive management techniques.

The short-term (50 year) objective is to manage for old growth characteristics across most of the mixed forest as opportunities occur through passive and active techniques. Retain and increase yellow birch, white pine and hardwood components on aspen, white birch, northern hardwood and hemlock stands as secondary objectives. Wetland communities' objectives would be met through passive management in many areas. Black spruce and tamarack may have some timber harvest to regenerate those species.

Management of Forest Types in the Forest Matrix (1,900 acres, which is 25% of Area 10)

Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 10. The pie chart on the following page indicates how much of Area 10 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus

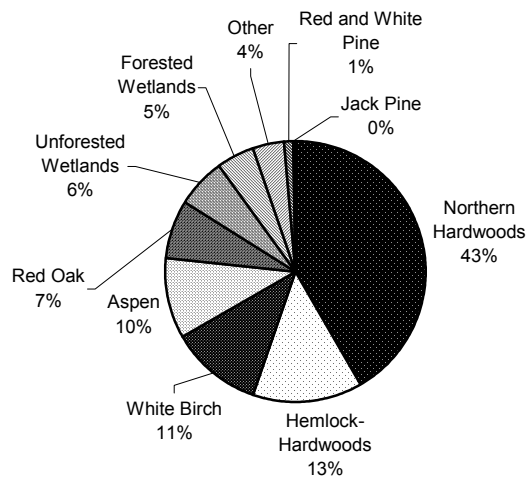
Summary for Area 10: Lake Laura Loamy Hills

- Opportunity to maintain a forest with large, old trees, and the characteristic species and ecosystem functions associated with old growth hemlock-hardwood forests.
- 7,400 acres of state owned land in this area.
- Management for old growth and other unique resources on about 75% of this area (5,500 acres) in Focus Sites. Also, management for small, scattered old growth sites.

Sites. The management of individual old growth and biotic inventory sites is listed below.

In Area 10, note the abundance of northern hardwoods (43%), hemlock-hardwoods (13%), white birch (11%) and aspen (10%). The Lake Laura Loamy Hills stands out on the NHAL landscape for having a slightly loamier soil than the rest of the Pitted Outwash landscape. It supports a mixed hardwood-hemlock-white pine forest. Much of Area 10 is made up of old forest that is grouped within the Focus Sites. Within the Forest Matrix, all aged hardwood management and aspen management would compliment the management of the Focus Sites. Unforested wetlands make up 6% of the area, and forested wetlands 5%.

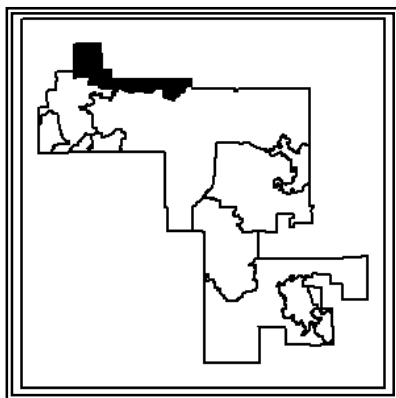
Current Land Cover in Area 10



Focus Sites--Old Growth and Biotic Inventory Sites (5,500 acres, which is 75% of Area 10)

- Ballard Lake (CROG 25B) is an 85-year old red oak and northern hardwood site between Ballard and Partridge Lakes with 57 acres of old growth hemlock. The site was recently thinned. The management goal is to perpetuate the old growth character of the site, promoting hemlock, red oak and other long lived species in a diverse forest dominated by large trees, diverse structure and a diversity of tree species and ages.
- Lake Alva Hemlock-Hardwoods (CROG 4A, BI 22) is forested with mature stands of yellow birch and hemlock. The older and least disturbed stands exhibit or are developing old growth structural characteristics. The management goal is to promote the old growth character of the site and look for opportunities to manage for a forest dominated large trees, diverse structure and a diversity of tree species and ages. The majority of the area would be passively managed. Some limited areas may be actively managed through thinning and regeneration activities.
- Lake Laura and Salsich Lake (CROG 2A , BI 23) is a large complex of old northern hardwoods and hemlock with a mixture of red oak and white pine. There are several inclusions of old growth hemlock and white pine. The management goal is to perpetuate the old growth character, promoting hemlock and other long lived species in a diverse forest dominated by large trees, diverse structure and a diversity of tree species and ages. The older and least disturbed stands exhibit or are developing old growth structural characteristics. This site is significant because of its size, lack of development, and diverse aquatic biota. Parts of this large site would be passively managed and other parts managed to perpetuate late-succession northern hardwood forest qualities and move some stands to late successional structure.
- Plum Lake Hemlocks (CROG 3A, BI 24) is an old growth hemlock and hardwoods site with scattered red oak, white pine, and red pine between Plum and Star Lakes. The area would be passively managed.

Area 11: Winegar Moraines



Description of Setting

The Winegar Moraines are located at the northwest “top” of the NHAL and make up most of the proposed northern boundary expansion. The loamy soils and hardwood forests of this 10,000 acre area are uncommon within the state forest. The topography of the Winegar Moraines is predominantly rolling, with abundant wetlands and many lakes. It is characterized by heavier soils that support northern hardwoods and hemlock-hardwoods. Soils are mostly well drained sandy loams, silt loams and organic deposits. Historically, wind was the dominant disturbance factor in the older forest.

Blowdowns of individuals and small groups of trees were frequent, while blowdowns of larger patches were infrequent. Catastrophic

fires were extremely rare. Fire was the major disturbance factor in the more sandy soil areas. At European settlement, the uplands were mostly covered with hemlock and yellow birch, with sugar maple as a secondary species. The drier sites in the area included white birch and white pine with secondary aspen, red pine, yellow birch and sugar maple. Within the forested wetlands, tamaracks dominate, with black spruce secondary. Today’s upland forest contains both aspen and northern hardwoods stands. The habitat types in this area are characterized by herbs such as wild lily-of-the-valley, lady fern, shield fern, grasses and sedges, and big leaf aster, with a poorly developed shrub layer. There are also areas of hemlock-hardwoods, white birch, and black spruce forest, and unforested wetlands.

Objective: Long Term and Short Term

The long-term (100 year) objective for this area is to maintain and enhance existing stands of old growth character northern hardwoods within a variable Forest Matrix. Some stands would be managed to promote northern hardwood species and age diversity and to maintain stand health and vigor. A diversity of forested and unforested wetlands would be maintained. A portion of the area would be maintained in early successional forest types to replace older stands that have reached biological maturity. Scattered hemlock and northern hardwood stands would be maintained and expanded as opportunities exist. Old growth characteristics would be enhanced through a variety of active and passive management techniques. The Forest Matrix would be managed to compliment the management of the Focus Sites.

The short-term (50 year) objective is to manage for old growth characteristics across most of the mixed forest through passive and active management as opportunities occur. Yellow birch, white pine and hardwood components on aspen, white birch, northern hardwood and hemlock stands would be retained and increased as secondary objectives. Aspen, white birch, and other early successional forest types would be regenerated at maturity to retain these types in some areas. A diversity of forested and unforested wetlands would be maintained.

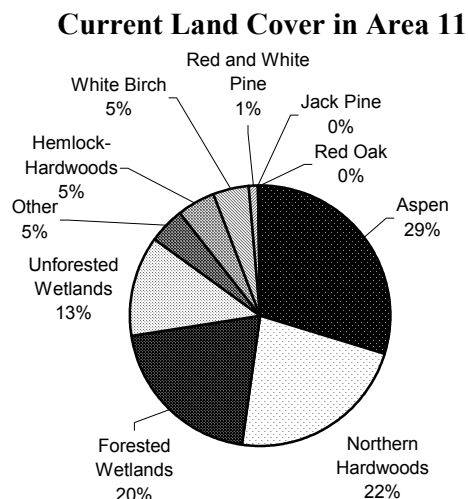
Summary for Area 11: Winegar Moraines

- Loamy soils, hardwoods, and forested wetlands common here, unlike on most of the NHAL.
- 10,000 acres of state owned land in this area.
- Most of the northern boundary expansion would be in this ecological type.
- Opportunity to maintain and restore areas of northern hardwood and hemlock-hardwood communities.
- Conservation of forested and unforested wetlands that provide habitat for many rare species and help protect water quality.
- Management for old growth and other unique resources on about 50% of this area in Focus Sites. Also, management for small, scattered old growth sites.

Management of Forest Types in the Forest Matrix (5,000 acres, which is 50% of Area 11)

Please see the Forest Management – Forest Matrix section (pages 29-34) for information on the typical management of Area 11. The pie chart indicates how much of Area 11 is currently grouped into each dominant forest type. The percentages include both Forest Matrix and Focus Sites. The management of individual old growth and biotic inventory sites is listed below.

In Area 11, note the abundance of aspen (29%), northern hardwoods (22%), hemlock-hardwoods (5%), and white birch (5%). The Winegar Moraines stands out on the NHAL landscape for having a loamy soil distinct from the sandier Pitted Outwash landscape. It supports a mixed northern hardwood forest. Within the Forest Matrix, all aged hardwood management and aspen management would compliment the management of the Focus Sites. Forested wetlands make up 20% of the site, and unforested wetlands make up 13%.



Focus Sites (Old Growth and Biotic Inventory Sites) (5,000 acres, which is 50% of Area 11)

- Catherine Lake, Twin Lake, and North Bass Lake Hemlock-Hardwoods (CROG 5A, 6A, 17AB and BI 1, 2) is a complex of old growth hemlock-hardwood stands and lowland conifer stands. This area includes some of the oldest trees on the NHAL, and some old growth areas that were not logged in the cutover a century ago. The management goal is to promote old growth characteristics and look for opportunities to manage for a forest dominated by large trees, diverse structure, and a diversity of tree species and ages. Some limited management may occur to enhance old growth characteristics or regenerate hemlock, but most of the area would be passively managed.
- Rice Creek Complex (BI 10) features a large, diverse conifer swamp of white cedar, balsam fir, black spruce and tamarack. Other attributes of this site include open bog and muskeg, upland white cedar, several small lakes and two small northern fens. Several stands of old growth hemlock-hardwoods are present with huge white pine. Passive management would protect the wetland attributes. Adjacent aspen and white birch stand management would be tailored to protect water quality impacts.
- Toy Lake (BI 8) is half in the Winegar Moraines and half in the Manitowish Peatlands (Area 6). A large wetland complex of hardwood swamp, white cedar swamp and alder thicket surrounds Toy Lake. Within this wetland site are scattered “islands” or ridges that support mature hemlock-hardwoods. All wetland communities and old growth stands would be maintained through passive management. Management of outlying aspen, white birch and northern hardwood stands would maintain and enhance those types.

Glossary for the Land Management Section

- **Active Management:** Management where objectives are achieved with direct action. Active forest management may include timber harvesting, ground disturbance, planting, chemical or mechanical applications, and prescribed burning.
- **Adaptive Management:** A dynamic approach to forest management in which the effects of treatments and decisions are continually monitored and used, along with research results, to modify management on a continuing basis to ensure that objectives are being met.
- **Biological Diversity:** The variety and abundance of species, their genetic composition, and the communities, ecosystems and landscapes in which they occur. Biological diversity also refers to the variety of ecological structures, functions, and processes at any of these levels.
- **Community Restoration** recognizes that communities, species, structural features, microhabitats, and natural processes that are now diminished or absent from the present landscape have a valuable role to play in maintaining native ecosystems. (Biotic Inventory and Analysis of the NHAL State Forest, 1999) Under some definitions, community restoration means moving the current composition and structure of a plant community to a composition and structure that more closely resembles that of the presettlement vegetation. (Community Restoration and Old Growth on the NHAL State Forest Assessment, 2001)
- **Focus Sites:** In this document, Focus Sites refer to designated sites that would be managed for old growth characteristics or other ecological features such as pine barrens in the uplands and protection of wetlands and water resources in the lowlands.
- **Forest Matrix:** In this document, the Forest Matrix refers to any part of the forest not contained in a Focus Site. The Forest Matrix is made up of a wide variety of site conditions and forest types, with a lot of variability across the landscape.
- **Passive Management:** Management where objectives are achieved without direct action. Monitoring and protection would still occur in these areas. Invasive exotic species may be removed from passive management areas.
- **Sustainable Forestry:** The practice of managing dynamic forest ecosystems to provide ecological, economic, social, and cultural benefits for present and future generations.